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WASTE CHARACTERIZATION INSPECTION REPORT

EPA INSPECTION No. EPA-Hanford CCP-09.03-8

of the

CENTRAL CHARACTERIZATION PROGRAM
AS IMPLEMENTED AT THE HANFORD SITE

September 8-12, 2003

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Radiation and Indoor Air
Center for Federal Regulations
1200 Pennsylvania Ave., NW
Washington, DC 20460

December 2004

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Attachments

1.0 EXECUTIVE SUMMARY

In accordance with 40 CFR 194.8(b), the U.S. Environmental Protection Agency (EPA or Agency or we) conducted EPA Inspection No. EPA-Hanford-CCP-09.03-8 from September 8-12, 2003, at the Hanford Site in southeastern Washington State. The purpose of the inspection was to determine the technical adequacy of the Central Characterization Project (CCP) as implemented at Hanford for the characterization of transuranic (TRU) debris waste to be disposed of at the Waste Isolation Pilot Plant (WIPP) in New Mexico using acceptable knowledge (AK), nondestructive assay (NDA), nondestructive examination (NDE), and data transfer using the WIPP Waste Information System (WWIS). Additionally, the inspection evaluated the use of Hanford CCP's NDA and NDE systems to characterize Plutonium Finishing Plant (PFP) debris (S5000), with the related AK and programmatic requirements being carried out under EPA's already-approved Hanford Site program.

We must verify compliance with 40 CFR 194.24 before waste may be disposed of at WIPP, as specified in Condition 3 of the Agency's certification of WIPP's compliance with disposal regulations for TRU radioactive waste (63 FR 27354, 27405; May 18, 1998). The waste characterization (WC) systems and processes that EPA inspected were for a group of waste streams that are collectively categorized as retrievably-stored, contact-handled (CH) TRU (i.e. greater than 100 nCi/g TRU) debris waste. EPA's inspection focused on AK, NDA, NDE, and data transfer using the WWIS. The visual examination (VE) process was not included in the inspection because it has been performed by the site's already approved program. The NDA system inspected as part of this inspection was a mobile Segmented Gamma Scanner (SGS) supplied by Mobile Characterization Services (MCS) and located at Hanford's Central Waste Complex.

EPA conducted the initial inspection of the CCP program at Hanford in September 2003. The inspection resulted in a key finding requiring CBFO response prior to approval. Since then DOE provided responses to our information request to resolve these findings and this report reflects our adequacy determination. Upon reviewing this information, we have determined that DOE satisfactorily resolved two findings and five concerns discussed in this report. During the review of additional information provided post inspection, however, EPA identified two concerns but these do not require a response.

In 2003, EPA-proposed changes to the site inspection and approval process at 40 CFR 194.8. These changes were promulgated on July 16, 2004, and became effective October 14, 2004. Our September 2003 inspection was to approve a new CCP program (AK and NDA) at Hanford under the 194.8 authority; we however, are issuing our approval decision after the effective date. Therefore, we must follow our new site approval process requiring us to make this report containing our proposed approval decision available for public review for 45 days. At the end of the public comment period and upon consideration of public comment received, we will issue a final approval letter.

Based on the inspection results, EPA has determined that the Hanford CCP's AK, NDA using SGS equipment, NDE (RTR only) and WWIS programs can adequately characterize retrievably-stored, CH TRU (i.e., greater than 100 nCi/g) debris waste. Visual examination of PFP's debris drums was performed by the Hanford and was not evaluated during September 2003 inspection. Hanford CCP has already completed its intended waste characterization activities. All characterization was accomplished using exclusively the equipment and procedures described in our proposed approval, and applied solely to the PFP debris waste stream. Because CCP operations at Hanford have concluded, we don not expect any changes or expansions to its debris waste characterization program. Therefore, for efficiency and simplicity, we are categorizing any and all changes as Tier 1. We believe this approach is simple and expedient, given that changes are not expected. Furthermore, this is appropriate given that any changes, if they did occur, would require re-deployment of the CCP at Hanford and warrant a high level of scrutiny. We emphasize that EPA does not believe that the Hanford CCP baseline compliance decision is typical of the inspections and approvals that will be done in the future under the new requirements of 40 CFR Part 194.8(b). Also, if Hanford CCP intends to use load management for these CH TRU debris waste at PFP, EPA approval in accordance with EPA's August 3, 2003 memorandum will be necessary.

EPA is proposing a Tier 1 designation to any changes to the approved Hanford CCP waste characterization activities. This means that DOE must obtain approval from EPA prior to using any new or revised processes, equipment, or waste streams.

Summary of EPA Approval

Waste Characterization Element	PFP Debris Waste	PFP Solid Waste
AK	Approved	Not approved
NDA	Approved – SGS	Not approved
NDE	Approved – RTR Approved – VE*	Not approved Not approved
WWIS	Approved	Not approved
Load Management	Not approved	Not approved

* - VE of the PFP debris waste not performed by CCP but was done by the Hanford using their approved VE procedures.

2.0 PURPOSE OF INSPECTION

The U.S. Environmental Protection Agency (EPA or Agency or we) certified on May 18, 1998, that the Waste Isolation Pilot Plant (WIPP) will comply with the radioactive waste disposal regulations at 40 CFR 191 (63 Fed. Reg. 27354). EPA's certification of the WIPP contains the following condition (Condition 3): "The Secretary shall not allow shipment of any waste from any additional [Los Alamos National Laboratories (LANL)] waste stream(s) or from any waste generator site other than LANL for disposal at the WIPP until the Agency has approved the processes for characterizing those waste streams for shipment using the process set forth in 40 CFR 194.8." In accordance with 40 CFR 194.8(b)(2), EPA must inspect waste characterization systems (WC) and processes used by the Department of Energy (DOE or Department) transuranic (TRU) waste sites before approving those sites to dispose of waste at WIPP.

The approval process described at 40 CFR 194.8 requires the Department to provide EPA with two types of information: (1) information on process knowledge[1] for waste streams proposed for disposal at WIPP, and (2) information on the system of controls in place at the generator site used to confirm that the total amount of each waste component emplaced in WIPP will not exceed limits identified in WIPP's Compliance Certification Application (CCA). After reviewing these materials, an EPA inspection/surveillance team visits the site to verify that process knowledge and other elements of the system of controls (namely, nondestructive assay (NDA), visual examination (VE), real-time radiography (RTR), and WIPP Waste Information System (WWIS) are technically adequate and being implemented properly. Specifically, the EPA inspection/surveillance team verifies compliance with 40 CFR 194.24(c)(4), which states:

> *** Any compliance application shall: *** Provide information which demonstrates that a system of controls has been and will continue to be implemented to confirm that the total amount of each waste component that will be emplaced in the disposal system will not exceed the upper limiting value or fall below the lower limiting value described in the introductory text of paragraph (c) of this section.[2] The system of controls shall include, but shall not be limited to: measurement; sampling; chain of custody records; record keeping systems; waste loading schemes used; and other documentation.

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[1] Process knowledge refers to knowledge of waste characteristics derived from information on the materials or processes used to generate the waste. This information may include administrative, procurement, and quality control documentation associated with the generating process, or past sampling and analytic data. Usually, the major elements of process knowledge include information about the process used to generate the waste, material inputs to the process, and the time period during which the waste was generated. In the context of these reports specifically and waste characterization generally, EPA uses the term "acceptable knowledge" synonymously with "process knowledge."

[2] The introductory text of paragraph 40 CFR 194.24(c) states: "For each waste component identified and assessed pursuant to [40 CFR 194.24(b)], the Department shall specify the limiting value (expressed as an upper or lower limit of mass, volume, curies, concentration, etc.), and the associated uncertainty (i.e., margin of error) for each limiting value, of the total inventory of such waste proposed for disposal in the disposal system."

In other words, inspections verify that DOE waste generator sites, which characterize TRU waste prior to shipment to the WIPP, are characterizing and tracking the waste in such a manner that EPA is confident that the waste will not exceed the approved limits. By approving WC systems and processes at Hanford CCP, EPA certifies that those systems and processes can accomplish two tasks: (1) they can identify and measure the waste components (such as plutonium) that must be tracked for compliance[3]; and (2) they can confirm that the waste destined for the disposal at the WIPP has been properly identified as belonging to the group of approved waste streams. Under 40 CFR 194.24(h), EPA may perform follow-up surveillance to verify that a TRU waste site is shipping waste that belongs only to those waste streams or groups of waste streams that have been characterized by the approved processes.

3.0 PURPOSE OF THIS REPORT

This WC inspection report documents the basis for EPA's decision by explaining the results of Inspection No. EPA-Hanford-CCP-09.03-8 in terms of findings or concerns. The report, if applicable, provides objective evidence of outstanding findings (nonconformances) in the form of documentation. The report also describes any tests or demonstrations completed during the course of the inspection. The completed checklists attached to the report show the documents (principally procedures) that the EPA inspection team reviewed. To see any items identified in the attached checklists, please contact:

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Carlsbad, NM 88221

EPA's decision to approve or disapprove the system of controls (processes) used to characterize one or more waste streams at a site is conveyed to DOE separately by letter in accordance with 40 CFR 194.8(b)(3). This report identifies and explains the basis for EPA's decision as contained in the letter. EPA's approval or disapproval extends only to the processes reviewed during the inspection and identified in this report and its attachments. Only waste that can be adequately characterized using processes verified by EPA through inspection or surveillance may be shipped to WIPP for disposal.

On July 16, 2004, EPA promulgated changes to the site inspection and approval process at 40 CFR 194.8 (69 FR 42571) which became effective October 14, 2004. Therefore, even though the Hanford CCP inspection occurred in September 2003, EPA's Hanford CCP approval is

[3] The potential contents of a waste stream or group of waste streams determine which processes can adequately characterize the waste. For example, if acceptable knowledge information suggests that the waste form is heterogeneous, the site should select a nondestructive assay technique that suits such waste in order for adequate measurements to be obtained. Radiography and visual examination help both to confirm and quantify waste components such as cellulosics, rubbers, plastics, and metals. Once the nature of the waste has been confirmed, the assay techniques then quantify the radioactive isotopes in the waste. In the given example, a TRU waste site may be able to characterize a wide range of heterogeneous waste streams or only a few. EPA's surveillance scope is governed by a site's stated limits on the applicability of proposed waste characterization processes.

subject to these new requirements at 40 CFR 194.8. The actual WC inspection process under the new rule and the old rule is similar. The site approval process, however, now requires that EPA seek public comment on a proposed decision. Also, the new rule requires EPA to assign waste characterization component specific tiers and any applicable limitations. Therefore, Section 7 of this report assigns the same tier to all WC process examined during the September 2003 inspection. Also, the new rule requires EPA to assign tiers specific to individual components of the waste characterization processes inspected under 40 CFR 194.8. For example, EPA must assign a tier to equipment, procedure, and personnel used for NDA performed to quantify radiological contents of TRU waste containers to be disposed of at WIPP. The assigned tiers would convey when a site can make changes to the approved WC elements without EPA approval and when EPA inspection/review/verification is necessary before the changes can be implemented. Since this inspection was done under the old rule, each of WC process components (namely, equipment, procedure, and personnel qualifications) were evaluated individually for adequacy, however, we did not rate them individually for tier assignments and associated limitations. Therefore, we assigned proposed tiers to each waste characterization process and not individual WC process component mentioned above. This approach, hence, is unique to this inspection as it occurred prior to the rule change.

4.0 SCOPE

The scope of Inspection No EPA-Hanford-CCP-09.03-8 incorporated the technical adequacy of the system of controls used to characterize waste material parameters (WMPs) and the activities of the ten WIPP-tracked radionuclides (^{241}Am, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{90}Sr, ^{233}U, ^{234}U, and ^{238}U), with an emphasis on AK, NDA, NDE and the WWIS. EPA did not examine VE as part of this inspection.

5.0 DEFINITIONS

Finding: A determination that a specific item or activity does not comply with 40 CFR 194.24(c)(4). A finding requires a response from the Carlsbad Field Office (CBFO).

Concern: A judgment that a specific item or activity may or may not have a negative effect on compliance and, depending on the magnitude of the issue, may or may not require a response.

6.0 INSPECTION TEAM

EPA's WC surveillance team members are identified below. In addition, an observer from the Environmental Evaluation Group (EEG) was present at the inspection.

Inspection Team Member	Position	Affiliation
Mr. Ed Feltcorn	Inspector	EPA
Mr. Jim Oliver	Inspector	EPA Contractor
Dr. David Stuenkel	Inspector	EPA Contractor
Ms. Connie Walker	Inspector	EPA Contractor

Mr. Don Hammer	Inspector	EPA Contractor
Dr. Scott Webb	Observer	EEG

Numerous DOE CBFO and Hanford Central Characterization Project (CCP) personnel, including both DOE staff and support contractors, participated in EPA's inspection, in addition to performing a separate DOE audit of the same processes. Ms. Annabelle Axinn, a CBFO Technical Assistance Contractor (CTAC) employee, served as CBFO Audit Team Leader and was DOE's primary point of contact with the EPA inspection team. Other CTAC employees supported the CBFO audit team. The current Hanford Facility Operating Contractor is Fluor Hanford.

Hanford, located along the Columbia River near Richland, Washington, is a 560 square mile area managed by DOE. Hanford was established in secrecy during World War II to produce plutonium for the United States' nuclear weapons program. Peak production years were reached in the 1960s when eight plutonium-producing reactors were operating at Hanford. All weapons material production was halted in the late 1980s. Hanford is now engaged in the world's largest environmental cleanup project. TRU waste (i.e. waste containing greater than 100 nCi/g transuranics) generated at Hanford during the production years and during environmental cleanup are destined for disposal at the WIPP, the geologic repository for the disposal of the nation's TRU waste. Hanford is an interim storage facility for defense-generated TRU-contaminated waste.

Hanford CCP's responsibilities include the WC of TRU-contaminated waste prior to shipment to WIPP. With respect to Hanford's CCP, approval is sought for use of the CCP to assist with NDA and NDE examination of PFP (Plutonium Finishing Plant) waste, with VE and AK of this waste, as well as program management activities, being performed by the site itself. However, CCP also seeks approval to conduct full characterization of TRU waste (i.e. including AK and program level evaluations, including Waste Stream Profile From (WSPF) preparation, etc). To this end, EPA evaluated implementation of AK, NDA, NDE, and WWIS with respect to data transfer for a Kerr-McGee Cimarron facility debris waste stream.

The purpose of this inspection was to evaluate the use of CCP's NDA and NDE equipment to characterize PFP waste to augment and facilitate characterization occurring under Hanford's already-approved characterization program. In addition, EPA examined the use of the Hanford CCP's program to fully characterize waste, including AK, WWIS, and related programmatic elements (WSPF as part of AK).

7.0 PERFORMANCE OF THE INSPECTION

EPA Inspection No. EPA-Hanford-CCP-09.03-8 of the Hanford site took place September 8-12, 2003. The inspection focused on the following elements of the Hanford CCP's TRU WC program: AK, NDA, NDE, and waste data transfer using the WWIS. These elements are included in the "system of controls" for WC that is identified in 40 CFR 194.24(c)(4). The inspection was conducted in the following steps:

1) Preparation of draft checklists prior to the inspection based upon CCA documents;

2) Review of site procedures and other information, and modification of EPA checklists, if necessary, to incorporate site-specific information; and

3) On-site verification of the technical adequacy or qualifications of personnel, procedures, and equipment by means of interviews, demonstrations, and completion of checklists.

The following subsections address each technical area in turn. Each subsection identifies, as appropriate, key documents that the EPA inspection team reviewed, key site personnel who were interviewed, key demonstrations that were performed, and any findings or concerns. The checklists attached to this report (Attachments A.1 - A.4) reveal in greater detail the scope of EPA's inquiries and the specific items and activities reviewed.

7.1. Acceptable Knowledge (AK)

AK is used to help determine the following aspects of TRU waste for the Hanford CCP program:

- General waste material parameter (WMP) content of waste;
- Radionuclide content of waste with respect to identifiable isotopic ratios of the EPA 10 radionuclides and other radionuclides, and nature of waste with respect to TRU vs. non-TRU content and related waste management issues;
- Waste processes that generated waste, including but not limited to location of waste generation, programmatic considerations, and buildings in which wastes were generated;
- Waste stream determination; and
- Defense waste status.

EPA's Inspection EPA-CCP-Hanford 09.03-8 was performed to evaluate compliance of the program for characterizing retrievably-stored debris waste (S5000). To accomplish this, several technical elements were assessed. The checklist at Attachment A.1 includes objective evidence examined to assess these elements.

- Overall procedural technical sufficiency and scope, with emphasis on tracking of the AK WC process for individual containers and waste streams;
- Characterization of WMPs and radionuclides as required by 40 CFR 194.24, the revised CH-Waste Acceptance Criteria (WAC), and attachments to the CCA;
- Compilation of AK information and use of supplemental information;
- Confirmation of AK and resolution of discrepancies;
- Technical adequacy of AK characterization results;
- Preparation of the AK summary;
- Technical adequacy of required procedures (e.g., a consistent definition of waste streams);
- Reassignment of any waste based on an analysis of AK and discrepancies; and
- Appropriate determination of AK accuracy.

The following documents were among those examined to assess these issues, and include those evaluated to determine whether AK data assembly, compilation, confirmation, and

accuracy assessments were being adequately performed:

- P001 *Determination of the Quantity and Locations of the Plutonium Retained in the Cimarron Fuel Plant Systems,* Sequoyah Fuels Corporation, DOE/RK/10382-5, 1983.

- U001 M4T00-PJC-02-124, *Hanford Site Transuranic Waste Management waste Specific Acceptable Knowledge Documentation for Kerr-McGee, Cimarron Plutonium Fuel Fabrication Facility Debris, Richland Washington,* Flour Hanford, Draft Revision 1.

- Disposal Records for Transuranic Waste From Kerr-McGee Nuclear Corporation (Contract DE-AC-6-77RL013030), Oklahoma City, OK, Kerr-McGee Nuclear Corporation.
- CCP AK-RL-001, Central Characterization Project Acceptable Knowledge Summary Report for Hanford Site, Kerr-McGee, Cimarron Plutonium Fuel Fabrication Facility D&D Debris, Revision 0, July 28, 2003.

- D002 Acceptable Knowledge Source Document Discrepancy Resolution - Mixed Waste, Lead and Mercury RCRA determinations, 7/25/03.

- P004 *Technical Recommendations in the Design and Operation of a Plutonium Fuel Fabrication Facility to Facilitate Decontamination and Decommissioning,* Sequoyah Fuels Corporation, DOE/RL/10382-2, 1983.

- C002 Sr-90 to Cs-137 Ratio for Appendix E of Hanford Site Transuranic Waste Certification Plan for NDA, Memorandum from R.L.Clinton to P.J.Crane, April 11, 2002.

- Contents Inventory Sheets, Containers 6501-1-21.

- Attachment 4 Acceptable Knowledge Source Document Reference List dated 8/27/03.

- Attachment 7 Radionuclides July 23, 2003.

- Attachment 1 Acceptable Knowledge Documentation Checklist.

- Attachment 8 Waste Containers, undated.

- Interoffice Correspondence September 8, 2003, *Calculated Miscertification rate for the CCP Scope of Work at the Hanford Site, Summary Category Group S5000 and Radiography/Visual Examination Comparison Reports for Containers 6501-1-21 and 0005852*.

- Attachment 11 Acceptable Knowledge Accuracy Report, September 8, 2003.

- Attachment 6 Waste Form, Waste Material Parameters, Prohibited Items, and Packaging. Undated.

- Attachment 10- Acceptable Knowledge Confirmation Checklist, Draft undated.

- Attachment 5 –Hazardous Constituents, Draft Undated.

- Attachment 12 – Acceptable Knowledge Re-Evaluation Checklist (dealing with toluene in headspace gas) Draft dated Sept 8, 2003.

- P002 *Hanford Site Transuranic Waste Management Program Acceptable Knowledge Documentation for Retrievably Stored Contact Handled Waste*, July 2, 2003, HNF 3461.
- P005 *Nondestructive Assay (NDA) Techniques and Procedures*, Sequoyah Fuels Corporation, 1985.

- P003 *Decontamination and Decommissioning of the Kerr-McGee Cimarron Plutonium Fuel Plant*, Sequoyah Fuels Corporation, DOE/RL/10382-6, December 20, 1988.

- P007 Miscellaneous MSDS Sheets and Manufacturer's Information, July 3, 2003.

- C001 Disposal of Transuranic Waste from Kerr-McGee Nuclear Corporation (Contact DE-AC06-77RL01030), July 2003.

- D001 Acceptable Knowledge Source Document Discrepancy Resolution-Waste Matrix Code for Kerr McGee TRM D&D Debris, July 15, 2003.

- D002 Acceptable Knowledge Source Document Discrepancy Resolution-Mixed Waste, Lead and Mercury RCRA determinations, July 25, 2003.

- CCP-TP-005 Revision 12, CCP *Acceptable Knowledge Documentation*, 3/26/03.

- CCP-TP-002 Revision 13, *CCP Reconciliation of DQOs and Reporting Characterization Data*.

- Waste Stream Profile Form, RLMKMD.001, Draft Dated 9/9/03, Kerr McGee Cimarron Waste.

- Letter from T.G.Hedahl to K.McDonald, Management Assessment for Start Up of the Central Characterization Project (CCP) Acceleration Process Line (MA-CCP-0003-03) at Hanford, dated July 9, 2003.

- Training and Qualification, August 11, 2003. Surveillance by Steve Klover and Sheri Nance, dated 8/21/03.

- Batch Data Reports, NDE, RLRTRD002, NDA RLNDA002, RLDA001-PFP waste.

- Waste Storage Records, Waste Containers 6000-5-15, 6000-1-21.

- Batch Data Reports for single original Kerr-McGee container 1-21; containers 0014074 and 13343: NDA Batch Data Report RLNDA0016; HSG Batch Data Report WWSCF-030820R0-HSG.

- P023, A Brief History of the PUREX and U03 Facilities, WHC-MR-0347, Westinghouse Hanford Company, November 1993.

- March 18, 2004, Letter from Paul Detweiller, DOE to Frank Marcinowski, EPA; Response to EPA Inspection Report on Audit A-03-25 (EPA-Hanford CCP-09.03-8).
- D002, Acceptable Knowledge Source Document Discrepancy Resolution, Mixed Waste, Lead, and Mercury Determinations, 7/25/03.

- P002, Hanford Site Transuranic Waste Management Program Acceptable Knowledge Documentation for Retrievably Stored Contact Handled Waste, HNF-3461, Revision 7, Undated.

- C016, Memorandum to CCP Central Records, Additional Defense Activities Research, K. Peters, September 30, 2003.

- P020, The Defense Programs Origin of Transuranic Waste at Argonne National Laboratory- West, H. McFarlane, Argonne National Laboratory, November 11, 2001.

- U001, Hanford Site Transuranic Waste Management Waste Specific Acceptable Knowledge Document for Kerr-McGee, Cimarron Plutonium Fuel Fabrication Facility Debris, M4T00-PJC-02-124, Draft Revision 1 7/3/03.

- CCP-AK-RL-001, October 17, 2003, Central Characterization Project Acceptable Knowledge Summary Report for Hanford Site Kerr-McGee Cimarron Plutonium Fuel Facility D&D Debris Waste.

- Memorandum from K.Peters to CCP Central Records, RE: Evaluation of Radiological Distribution for Mixed Kerr-McGee Debris Waste Stream RLMKMD.001, September 30, 2003.

- P022, PUREX Plant Final Safety Analysis Report, SD-HS-SAR-001, Rev. 3, Rockwell Hanford Operations, June 1985.

- June 28, 2004, Memorandum from K.Peters to CCP Central Records, RE: Evaluation of Kerr-McGee Fuel Production and FFTF History.

- Email Clarification, K Peters: Additional Kerr McGee Information, Waste Stream Assignment, September 28, 2004.

During the inspection, we assessed several technical elements of Hanford CCP's AK process (see Attachment A.1), including those discussed below.

1) The AK process was adequate with respect to collection of mandatory information; however, it was inadequate with respect to supplemental data collection.

The CCP personnel adequately followed protocol with respect to collection of mandatory information, including site maps, building data, etc. However, the purpose of supplemental data collection is to "check" information obtained from generalized references that could address some of the mandatory requirements. Supplemental data is required because sites extract information from text unrelated to WC and input this information into AK summaries, without checking the data for applicability and accuracy with respect to WC.

As such, the AK Summary (AKS) report did not include sufficient supplemental AK references to support conclusions drawn in the document to satisfy the requirements that sites "shall obtain supplemental acceptable knowledge information." This requires "collection information as appropriate to support required information." While the specific nature of supplemental information is not mandated, the sites should consider including references presented in primary documents as part of the AK record, and reference these documents, as appropriate, in the AKS.

Further, the following technical topical areas were not adequately referenced for which appropriate supplemental information must be assembled and referenced in the AKS:

- Discrepancy Report D002 documented the combination of waste streams, but it did not specify the procedures, container-specific documents, or other records that support this determination (reference U001 did not directly address the issue, nor did U002).
- Table 4 did not include references that show the original determination of the isotopic ratios and percentages presented therein, as well as adequate justification for these ratios.
- The AKS must indicate the full isotopic distribution of the waste stream, such as whether it includes less than 100 nCi/g material, and the generalized volume/percentage of the waste that is less than 100 nCi/g, etc.
- Correlations to the original feed material from PFP and references need to be included/integrated.
- The applicability of PFP Sr-90/Cs-137 ratio determinations with respect to Kerr-McGee waste must be clearly presented, which links to the PFP plant as the origin of feed material need to be presented and supported via reference. Further, since AK information was being directly used by NDA personnel, all CH-WAC confirmatory allowances for AK, and all CH-WAC requirements with respect to AK must be specifically addressed in the AKS Document.
- The AKS needs to present a generalized representation of the WMPs important to performance assessment, including ferrous metals, non-ferrous metals, cellulosics, plastics, and rubber. In addition, the AKS must present information pertinent to prohibited items such as water. It is understood that the various attachments may contain information, but these were not attached to the AKS Report. Procedure CCP-TP-005 must also require the collection of this information.
- The AKS assumed that the decontamination activities that occurred at Kerr-McGee and which generated the decontaminating and decommissioning (D&D) waste in the

Kerr-McGee Cimarron waste stream also removed any contamination in the facility that resulted from production activities. However, this assumption was not well presented or adequately supported.

2) The defense waste determination was not well documented.

The site believes the defense determination was justified because the original feed material was created at the Hanford PFP. However, the use of this material in defense-related activities should be addressed. Specifically, the site should document that activities generating the waste were defense-related, or that subsequent facilities "fed" the process material performed defense-related activities. Ultimately, DOE is responsible for determining and defending its defense determination decision. This issue was captured in a CBFO-issued CAR (Corrective Action Report).

3) AK and NDA personnel did not adequately communicate regarding data use.

The AK Expert (AKE) argued that AK data acquisition and presentation of information could be more limited than that at other sites because the AK data was *not* being used by the NDA personnel in any way, shape or form. During the inspection, it was revealed that the Hanford CCP NDA personnel were using direct AK-derived isotopics when their own instrumentation failed to acquire a measurement. This lack of communication directly impacted the information presentation in the AKS, and assumptions on the part of the AKE (which proved erroneous) resulted in the preparation of an AKS that lacked the necessary detail.

4) Data limitations must be recognized within the AKS where these limitations impact the use of the AK information.

The AKE originally indicated that isotopic and radionuclide information in the AKS was not used by NDA personnel for isotopic ratio determination; this information is assembled to provide general supporting information with regard to the waste stream content and characteristics. This assumption proved to be erroneous. However, if the AKE had adequately identified data limitations in the AKS, this would have more appropriately limited the AK data use by others. Data limitations must be clearly spelled out and addressed in the AKS, particularly in instances where the AKE believed that this limitation curtails or limits the use of this information by others (i.e. NDA, NDE personnel, etc).

5) Assignment of the Waste Matrix Code (WMC) was technically adequate and was well documented.

The site had assigned WMC 5420, inorganic debris waste, which is appropriate and acceptable based upon analysis of Solid Waste Disposal Forms from 400 of the 1200 containers in the identified waste stream. However, while it was recognized that the waste stream may contain individual drums that do no fall into the specific WMC determination, the waste stream, as a whole, must. Further, since the AKE has not examined all Solid Waste Disposal Forms available, this assignment could ultimately prove incorrect if the remaining 800 records do not concur with the initial WMC assignment. As required for other sites, the site needs to track

outliers as part of the AK confirmation process (this could be done at the SPM (Site Project Manager) level, if appropriate), thus ensuring that the preponderance of the waste stream corresponds with the WMC determinations.

6) AK Accuracy determinations for Hanford CCP's program were not adequate with respect to radionuclides.

AK accuracy, as cited in the WAP (Waste Analysis Plan), requires comparison of radionuclide AK and measurement data, but is not specific with respect to how this is to be accomplished. In cases where AK data are used specifically as part of, in lieu of, or to directly support NDA measurements, the AK accuracy calculations should provide meaningful assessments of the use of this data to these ends. If, however, sites believe AK data do not provide this type of support, then the AK accuracy assessment should reflect the appropriate level of AK use. The Hanford CCP procedure must be revised to recognize this distinction.

7) Completeness and adequacy of the entire AK process could not be determined at the time of inspection because characterization data for only a single container was available.

Only a single container had been through the entire characterization process, and "dummy" WSPF, CIS (Characterization Information Summary), and AK Accuracy reports were generated from information other than the Kerr McGee waste to demonstrate completion of the process. EPA has required that more than a single container be completed so that the "dummy" forms can be based on actual data obtained, understanding that the final versions could differ because the Site Project Manager (SPM) will probably wait to complete the "real" forms when even more containers are characterized. EPA will reassess this issue when more container-specific data are obtained (three minimum), and when related reports are re-run to reflect this information.

At the end of the inspection, several findings and concerns had been identified. These are listed below. Following the inspection, information was provided to resolve most of the issues raised in the findings and concerns; the information or actions taken to resolve these issues are discussed below.

AK Finding No. 1: The AK process was inadequate with respect to supplemental data collection. The following technical topical areas were not adequately referenced for which appropriate supplemental information must be assembled and referenced in the AKS:

- Discrepancy Report D002 documents the combination of waste streams, but it does not specify the procedures, container-specific documents, or other records that support this determination (reference U001 does not directly address the issue, nor does U002).

  Resolution: Additional clarification concerning reasons the specific waste streams were broken out, including additional historical information was provided which indicated that the waste stream designation by Hanford CCP was adequate.

- Table 4 did not include references that show the original determination of the ratios and percentages presented therein, as well as adequate justification for these ratios.

  Resolution: EPA obtained a full copy of CCP-AK-RL-001, Rev.1, revised in October 2003, after the audit, in June 2004. This document was revised to include a more detailed radiological characterization discussion in Section 5.4.2, which presented several new references not examined during the inspection. Specifically, References C014, P022, and P023 were new references added after the inspection and were therefore not available to EPA at the inspection. In addition a memorandum entitled "Evaluation of Kerr-McGee Fuel Production and FFTF History, June 2004" provided several additional source documents, which confirmed the material sourcing from Hanford to the Kerr McGee Facility. Therefore, the initial issue identified by EPA in this bullet has been resolved, and the information must be included in the AKS Report.

- The AKS must specifically indicate the full isotopic distribution of the waste stream, such as whether it includes less than 100 nCi/g material, and the generalized volume/percentage of the waste that is less than 100 nCi/g, etc.

  Resolution: Revision 1 of the AKS, prepared after the audit and obtained by EPA since site inspection, included new information in Section 4.3.5 which discusses screening measurement with respect to <100 nCi/g waste, and went on to indicate that low level waste was segregated from >100 nCi/g waste. Based on this information, it appears that the site has segregated low-level from TRU waste and has managed this waste as a separate waste stream. It is therefore assumed that no portion of the subject waste stream would fall in this category and DOE will not "load manage" (i.e. combine <100nCi/g waste with >100nCi/g waste in a TDOP). This issue has therefore been adequately resolved.

  If DOE identifies the need to "load manage" in the future, the AKS must be revised to address the <100nCi/g component with respect to management practices, etc, and the AKS should then be provided to EPA for review and approval.

- Correlations to the original feed material from PFP and references were not adequately included/integrated.

  Resolution: The issue presented in this bullet was adequately resolved by information provided to address issues presented in Bullet 2.

- The applicability of PFP $^{90}Sr/^{137}Cs$ ratio determinations with respect to Kerr McGee waste must be better presented that links to the PFP plant as the origin of feed material should be better presented and supported via reference. Further, since NDA personnel are directly using AK information, all CH-WAC confirmatory allowances for AK, and all CH-WAC requirements with respect to AK must be specifically addressed in the AKS Document.

Resolution: The issue presented in this bullet was adequately resolved by information provided to address issues presented in Bullet 2.

- The AKS needs to present a generalized representation of the WMPs important to performance assessment, including ferrous metals, non-ferrous metals, cellulosics, plastics, and rubber. In addition, the AKS must present information pertinent to prohibited items such as water. It is understood that the various attachments may contain information, but these are not attached to the AKS Report. Procedure CCP-TP-005 must also require the collection of this information.

  Resolution: EPA was not provided the necessary waste material/matrix information in the additional references provided post inspection (i.e. C014), but EPA understands that the data are available on individual CIS. Because the appropriate information is available and can be provided in a summary table or form if need be, no revision of the AKS is necessary to address issue in this bullet.

- The AKS assumed that the decontamination activities that occurred at Kerr McGee and which generated the D&D waste in the Kerr McGee Cimarron waste stream also removed any contamination in the facility that resulted from production activities. However, this assumption was not well presented or adequately supported.

  Resolution: The post-inspection CBFO response provided to address this bullet was adequate.

AK Finding No. 2: The completeness and adequacy of the entire AK process could not be determined at the time of inspection because characterization data for only a single container was available. Only a single container had been through the entire characterization process, and "dummy" WSPF, CIS, and AK Accuracy reports were generated from information other than the Kerr McGee waste to demonstrate completion of the process. EPA has consistently required that more than a single container be completed so that the "dummy" forms can be based on actual data obtained, understanding that the final versions could differ because the SPM will likely wait to complete the "real" forms when even more containers are characterized. EPA shall reassess this issue when more container-specific data is obtained (three minimum), and when related reports are redone to reflect this information.

Resolution: With provision of additional batch reports following the conclusion of the inspection, the finding was resolved. Although no revised WSPFs and associated CIS, AK Accuracy reports, etc were provided, our experience has shown that Hanford CCP can adequately generate these documents.

AK Concern No. 1: AK and NDA personnel did not adequately communicate regarding data use. The AKE mistakenly assumed that NDA personnel were not directly using AK isotopic information as part of their measurement calculations, when, in fact, this was not the case. This lack of communication directly impacted how information was presented in the AKS, and assumptions on the part of the AKE resulted in the preparation of an AKS that lacked the

necessary detail. The site must develop a better communication protocol whereby the use of AK data is adequately communicated between AK and NDA personnel.

Resolution: DOE characterized the lack of communication between AK and NDA an isolated issue. Interviews indicated that the AKE was completely unaware of AK use by the NDA personnel. The need for adequate communication has been recognized as Hanford CCP added Section 4.4.17 to CCP-TP-005, which mandates NDA-AK communication. EPA inspections at LANL and Lawrence Livermore (performed after Hanford CCP) showed this new requirement was being met by joint NDA-AK preparation of a formal memorandum indicating that both parties completely understood and agreed upon the use of AK with respect to AK. While the response to the AK concern presented in the CBFO response is inadequate, we have learned through EPA inspections performed after Hanford CCP that actual implementation of the mandatory AK-NDA communication is taking place. Therefore, the intent of the concern has been addressed.

AK Concern No. 2: As required for other sites, the site should track WMP outliers as part of the AK confirmation process (this could be done at the SPM level, if appropriate), thus ensuring that the preponderance of the waste stream corresponds with the WMC determinations a practice that was not implemented at the time of inspection. This concern does not require a response.

Resolution: As required for other sites, the site should track WMP outliers as part of the AK confirmation process (this could be done at the SPM level, if appropriate), thus ensuring that the preponderance of the waste stream corresponds with the WMC determinations a practice that was not implemented at the time of inspection. This concern did not require a response, and none was provided post inspection.

AK Concern No. 3: AK Accuracy determinations for the CCP program were not adequate with respect to radionuclides. AK accuracy, as cited in the WAP, requires comparison of radionuclide AK and measurement data, but it is non-specific with respect to how this is to be accomplished. In cases where AK data were used specifically as part of, in lieu of, or to directly support NDA measurements, the AK accuracy calculations must provide meaningful assessments of the use of this data to these ends. If, however, sites believe AK data does not provide this type of support, the AK accuracy assessment must reflect this level of AK use. The CCP procedure should be revised to recognize this distinction. This concern requires a response.

Resolution: The comment contained a typographical error; the WAC, not WAP requires AK-radionuclide data comparison. These comparisons must be meaningful. DOE should re-evaluate Hanford CCP's procedure with regard to AK accuracy calculations for radionuclides, as this comparison gains importance when sites seek to use AK more and more as the basis for characterization. Since CCP program is not longer active at Hanford this outstanding concern no longer requires a response. If the CCP resumes work at Hanford PFP AK accuracy calculation procedures should be revised prior to implementation of the procedure.

Although most of EPA's concerns were addressed by provision of post-inspection information, EPA still identifies two (2) concerns as unresolved, neither of which requires a response.

AK Concern No. 4. DOE provided significant supporting information in post-inspection responses provided to EPA. We examined the data and found it to satisfactorily address many of the issues, but we also expect this information to be included in the AKS. The following information must be included in the AKS:

- Include additional information concerning waste streams designation as per the September 28, 2004, email clarifying this issue.
- Additional documentation concerning the source of Kerr McGee material (AK Finding, Bullet 2).
- Documentation of intent to waste load, if Hanford CCP ever decides to perform this activity (AK Finding, Bullet 3)
- Necessary waste material/matrix information as presented in AK Finding 1, Bullet 5 based upon Contents Inventory Sheets
- Decontamination and D& D information as presented in the response to AK Finding 1, Bullet 6.
- Results of the AK Memo mandated in Section 4.4.17 of CCP-TP-005, and inclusion of this memo in the AK record, which address concerns expressed in the previously identified in First AK Concerns 1 and 2.
- Meaningful AK-radionuclide data comparisons, as expressed in First AK Concern No. 4.

This concern does not require a response.

***AK Concern No. 5*:** As required for other sites, the site should track WMP outliers as part of the AK confirmation process (this could be done at the SPM level, if appropriate), thus ensuring that the preponderance of the waste stream corresponds with the WMC determinations a practice that was not implemented at the time of inspection. This concern does not require a response.

7.2. Nondestructive Assay (NDA)

EPA inspected a mobile NDA system consisting of a segmented gamma scanner referred to as the Mobile Segmented Gamma Scanner (SGS) located at the central waste complex. As part of the inspection, EPA reviewed the following elements of the NDA process:

- Capability of the measurement hardware and software to perform the required analyses;
- Technical adequacy of the assay program's documents and procedures; and
- Knowledge and understanding of the personnel involved in the NDA program.

The checklist at Attachment A.2 identifies the objective evidence that we examined for the SGS. The following documents were among those examined to assess whether NDA is being adequately performed:

- CCP-02-002, *CCP Transuranic Waste Certification Plan,* Revision 6; June 11, 2003.

- CCP-TP-050, *CCP Mobile Segmented Gamma Scanner Calibration Procedure*, Revision 2; July 2, 2003.

- CCP-TP-051, *CCP Mobile Segmented Gamma Scanner Operation*, Revision 6; July 24, 2003.

- CCP-TP-052, *CCP Mobile Segmented Gamma Scanner Data Reviewing, Validating and Reporting*, Revision 6; August 4, 2003.

- CCP-TP-058, *CCP Performance Demonstration Plan*, Revision 1; June 6, 2002.

- MCS-HANF-NDA-1000, *Calibration and Validation Test Plan for the MCS SGS at the Hanford Site*, Revision 0a; August 22, 2003.

- MCS-HANF-NDA-1010, *Calibration and Validation Plan Report for the MCS Segmented Gamma Scanner at the Hanford Site*, Revision 0a; August 22, 2003.

- CI-SGS-TMU, *Total Measurement Uncertainty for the MCS Segmented Gamma Scanner*, Revision 3.0; August 18, 2003.

- Batch Data Report RLNDA0001.

- Batch Data Report RLNDA0002.

- Batch Data Report RLNDA0003.

- Batch Data Report RLNDA0016.

During the inspection, we assessed several technical elements of Hanford CCP's NDA process (see Attachment A.2), as discussed below.

1) The design of the Mobile SGS was assessed.

At the time of the inspection, the SGS was located at the Hanford Site Central Waste Complex (CWC). The SGS has been designed to characterize the radiological components in 55-gallon (208 liter) drums, containing low-density waste materials, such as combustibles or debris. According to the calibration and validation test plan, MCS-HANF-NDA-1000, the waste to be assayed at Hanford, using the SGS, includes mixed and non-mixed TRU debris waste, much of it generated during the operation, maintenance, decontamination, and decommissioning of glove-boxes. The SGS uses two high-purity germanium (HPGe) crystals to detect gamma rays emitted by the radioactive material in the drums.

The first HPGe detector, referred to as the Segment Germanium (SeGe) detector, is used to detect the gamma rays emitted in each of nine (9) vertical segments. The SeGe is collimated and shielded to view a vertical slice of the drum approximately 4 inches in height. The drum is rotated during the measurement, and the SeGe detector is translated vertically between

measurements. In addition to measuring the gamma rays emitted by radioactive material inside the drum, the SeGe detector measures the transmission of gamma rays emitted by a ^{133}Ba source, located on the opposite side of the drum, to estimate and correct for the attenuation of gamma rays by the waste matrix. The SGS uses a pulser to estimate detector deadtime. Data acquisition and analysis is performed using the Genie PC/Gamma Waste Assay Software (GWAS) software package.

The SGS uses a second HPGe crystal, referred to as the Low-Energy Germanium (LEGe) detector, to measure the isotopic distribution of the major plutonium isotopes and ^{241}Am. The gamma ray spectrum, acquired at the same time that the drum is scanned using the SeGe detector, is analyzed using the Multi-Group Analysis (MGA) software package.

2) System calibration of the Mobile SGS had been performed as required.

The calibration of the SGS is documented in MCS-HANF-NDA-1000, *Calibration and Validation Test Plan for the MCS SGS at the Hanford Site*, Revision 0a and MCS-HANF-NDA-1010, *Calibration and Validation Plan Report for the MCS Segmented Gamma Scanner at the Hanford Site*, Revision 0a. The SGS was initially calibrated at the Nevada Test Site (NTS) using six mixed gamma line sources. The line sources contained ^{241}Am, ^{133}Ba, ^{137}Cs, and ^{60}Co. The SGS was calibrated using a surrogate drum containing the aforementioned line sources inside a foam matrix, with a density of 0.031 g/cm^3. Calibration included an energy calibration, reference peak calibration, efficiency calibration, and transmission source calibration, as described in CCP-TP-050, *CCP Mobile Segmented Gamma Scanner Calibration Procedure*.

The system calibration was redone (verified) after its relocation to the Hanford Site CWC using the six mixed gamma line sources in a foam matrix. Additionally, the calibration of the SGS was confirmed by assaying three surrogate drums containing weapons grade plutonium (WGPu) sources in a combustibles waste matrix. Each of the three surrogate drums contained a number of sources totaling 33, 100, and 166 g WGPu, respectively. Each surrogate drum was assayed six (6) times, and the measured accuracy and precision were evaluated against predefined limits.

The calibration is limited to the detection of gamma rays with energies between 59 keV and 1.332 MeV. The operating range of the system is defined as 0.1 to 200 g WGPu, with quantities below 0.1 g requiring expert technical review. The calibration is meant primarily for wastes, such as debris and/or combustibles, with low atomic number ($Z < 15$). Matrices with transmissions below 1%, measured at an energy of 356 keV, are flagged for expert technical review. Expert review is also required when the deadtime, as measured by the pulser, is greater than 60%.

3) The total measurement uncertainty (TMU) of assays performed on the Mobile Segmented Gamma Scanner (SGS) had been determined and documented.

The TMU for the SGS was documented in CI-SGS-TMU, *Total Measurement Uncertainty for the MCS Segmented Gamma Scanner*, Revision 3.0. Determination of TMU included uncertainties from counting statistics, calibration source uncertainties, isotopic ratio uncertainties (from MGA), matrix heterogeneity, source heterogeneity, source self-absorption, and end effects.

Uncertainties due to matrix and source heterogeneity are typically the most significant sources of uncertainty.

4) The lower limits of detection (LLD), including the minimum detectable concentration (MDC) of the Mobile SGS systems had been determined and documented.

The LLD, defined as that level of radioactivity that, if present, yields a measured value greater than the critical level with a 95% probability, where the critical level is defined as that value which measurements of the background will exceed with 5% probability. The LLD is a strong function of both the background and the efficiency of the system.

The determination of the LLD and MDC is documented in MCS-HANF-NDA-1010, *Calibration and Validation Plan Report for the MCS Segmented Gamma Scanner at the Hanford Site,* Revision 0a. The GWAS software used by the SGS calculates the LLD and the MDC for each assay based on the background and efficiency associated with that particular measurement. Nominal LLDs and MDCs had been determined for surrogate drums of combustible waste by assaying the drum fifteen (15) times with no radioactive sources present. The average MDC for the surrogate drum containing 61.7 kg of surrogate waste was 81 nCi/g, after the appropriate matrix correction factor (MCF) was applied. LLDs for the surrogate drum for the WIPP-tracked radionuclides, other than plutonium are also documented in MCS-HANF-NDA-1010.

5) Training requirements and status of the NDA operators were examined.

Procedure CCP-QP-002, Revision 13, 6/30/03 *CCP Training and Qualification Plan* was reviewed and found to be adequate. Ms. Debbie Freeze with the Hanford CCP training program from Carlsbad, New Mexico was interviewed and served as the point of contact for training records review. PO #5 on *Conduct of Operations* was identified as an additional resource for training and qualification requirements. The training records and qualification and selection requirements for the following personnel were reviewed and found to be adequate:

- Dr. John Fleissner – CCP NDA Expert Analyst;
- Dr. Bruce Gillespie - CCP NDA Expert Analyst;
- Mr. Andrew McLain – CCP NDA OP/ITR TS/FQAO;
- Mr. George Westeik – CCP Expert Analyst/Operator; and
- Mr. Marty Winterose – CCP NDA Operator.

6) EPA replicate testing of the Mobile SGS was performed and evaluated.

The purpose of the replicate testing performed as part of this inspection is to provide the EPA with an independent means to verify that the IWAS (Integrated Waste Analysis System) could provide consistent, reproducible results for the determination of the quantity of ten WIPP-tracked radionuclides (^{241}Am, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{90}Sr, ^{233}U, ^{234}U, and ^{238}U) and the TRU alpha concentration. Re-assay of drums previously characterized on the same system or instrument is performed in order to:

- show that the instrument produces results consistent with the reported total measurement uncertainty (TMU), by comparing the sample standard deviation for a number of replicate measurements taken over several hours or days to the reported TMU; and to

- show that the instrument provides reproducible results over longer periods of time, such as weeks or months, by comparing the results of the replicate measurement(s) to the original reported values.

As part of the inspection to certify the Mobile SGS, EPA requested that Hanford CCP reassay three (3) drums that EPA randomly selected from a list of drums previously assayed on the Mobile SGS. The drums included containers 0013652, 0013665, and 6000-5-15. Each of the drums was reassayed five (5) times. Two statistical tests, a chi squared (χ^2) test and t test were performed for each container. Data and results of the statistical analysis are included in Attachments B.1-B.6.

For Container 0013652 the *t* test showed only statistically significant differences between the original measurement assay values and the average of the five replicate measurements for the activities of ^{240}Pu and ^{242}Pu. The averages of the assay values for ^{240}Pu and ^{242}Pu are only 10% and 12% larger than the original assay values, a difference not inconsistent with the reported uncertainty and quite likely due simply to chance. The chi-squared (χ^2) test showed that, within the statistical limits of the test, the observed variances in the replicate measurements was less than or equal to the reported uncertainties for all values, besides the activity of ^{237}Np. The reported activity of ^{237}Np in the original assay is only about 1.3 microcuries (μCi), and the reported uncertainty in this instance, when the activity is likely near the detection, may be underestimated.

The *t* test for Container 0013665 showed no statistically significant differences between the original measurement assay values and the average of the five replicate measurements. The chi-squared test (χ^2) showed that, within the statistical limits of the test, the observed variances in the replicate measurements are less than or equal to the reported uncertainties.

For Container 6000-5-15, the *t* test showed no statistically significant differences between the original measurement assay values and the average of the five replicate measurements. The chi-squared (χ^2) test showed that, within the statistical limits of the test, the observed variances in the replicate measurements was less than or equal to the reported uncertainties for all values, besides the activity of ^{241}Am. Variations in the reported activities for ^{241}Am are greater than those expected based on the reported uncertainty.

Findings:

EPA's inspection team identified no NDA findings.

Concerns:

EPA's inspection team identified no NDA concerns.

7.3 Real-Time Radiography (RTR)

The Mobile Waste Real-Time Radiography (RTR) facility uses radiography to help determine the following aspects of TRU waste characterization at the Hanford facility:

- Types and amounts of WMPs;
- Presence or absence of items prohibited from disposal; and
- Testing for new operators on the RTR system using specifically-placed items.

The following documents were examined during the EPA audit conducted September 8-12, 2003, to assess whether radiography operated by CCP at the Hanford facility was being adequately performed. EPA specifically examined RTR on September 9 and 10, 2003.

- CCP-TP-099, Revision 0, *CCP RTR #4 Radiography Inspection Operating Procedure*, 07/15/03.

- CCP-TP-028, Revision 1, *CCP Radiographic Test and Training Drum Requirements, 08/01/2001*.

- RTR Batch Data Report RLRTR0021 (container numbers A13485, A13515, A13512, A12988, A13400, RH-A-85-050, RHZ-105-A13574, A12988 R, and A13535 IO).

- RTR Batch Data Report RLRTR0022 (container numbers 6000-5-3, 6000-5-9, RHZ-103-A13781, RHZ-102-A15898, A13346, A13265, RHZ-103-A14805, RHZ-103-A13643, RHZ-102-A13971, RHZ-102-A13921, A13346 R, and A13265 IO).

- RTR Batch Data Report RLRTR0018 (container numbers A13616, A13559, A13527, A13435, A10732, A13424, RH-A-85-072, A13612, A13406, A13499, A10805, A13408, RH-A-85-072 R, and A13527 IO).

- RTR Batch Data Report RLRTR0002 (container numbers 0013632, 0013668, 0013666*, 0013623, 0013666 R, and 013623 IO).

- RTR Batch Data Report RLRTR0010 (container numbers 6501-5-4, 6501-7-11, 6501-7-33, 6501-5-9, 6501-5-15*, 6501-5-7, 6501-7-11 R, and 6501-5-15 IO).

- RTR Batch Data Report RLRTR0007 (container numbers 6501-4-34, 6501-3-34, 6501-2-33, 6501-3-2*, 6000-3-20, 6000-3-25, 6000-5-2, 6000-3-34, 6501-4-34 R, and 6501-3-2 IO).

- RTR Batch Data Report RLRTR0006 (container numbers 6501-1-6, 6501-1-8, 6501-3-27, 6501-3-11, 6501-2-32, 6501-2-3, 6501-3-6, 6501-1-18, 6501-1-6 R, 6501-2-3 IO).

- RTR Batch Data Report RLRTR0024 (container numbers RHZ-102-A14053, RHZ-108-A13671*, RHZ-212-A16108, RHZ-102-A16066, RHZ-102-A14853, RHZ-103-A15610, RHZ-212-A16108 R, and RHZ-102-A14053 IO).

- RTR Batch Data Report RLRTR0005 (container numbers 6501-1-13, 6501-2-30, 6501-3-19, 6501-1-21, 6501-3-38, 6501-2-4, 6501-2-18, 6501-4-1, 6501-2-18 R, and 6501-1-21 IO).

- M4T00-PJC-02-126, Attachment 1, HNF-6899, Draft Revision 3, "*Hanford Site Transuranic Waste Management Acceptable Knowledge Documentation for the Plutonium Uranium Extraction Plant*."

*For each of the above containers, the associated videotape record was also reviewed as part of the inspection.

This inspection was designed to review the procedures for using RTR for the characterization of waste generated by Kerr-McGee and the Hanford PFP. Both of these waste streams are considered debris waste.

EPA inspectors verified the technical elements of Hanford CCP's RTR processes listed below. The checklist at Attachment A.3 identifies the objective evidence examined by EPA.

1) Overall procedural technical sufficiency and scope, with emphasis on quantitative and qualitative identification of WMPs

The Mobile RTR system procedure, documented in *CCP-TP-099, Revision 0, CCP RTR #4 Radiography Inspection Operating Procedure*, contained specific information on performing non-intrusive radiography including, operational set-up and check-out, identification of prohibited items, assignment of WMPs and estimation of weights and volumes, confirmation of WMCs, input of data, issuance of non-conformance reports, and technical review of radiography results.

2) Characterization of WMPs as required by 40 CFR 194.24

The procedure required that at the beginning of every shift in which drums are subject to examination, radiography calibration be conducted to ensure repeatable high-quality results. This was confirmed during an interview with an RTR operator on 9/9/03 and further verified during EPA's examination of RTR on two waste containers during the inspection. The operator runs a test drum and takes scans to determine that images are clearly visible. The standard is that a minimum of five (5) line pairs per cm (lp/cm) are clearly visible on the calibration scale during Lines/Pair Resolution Test, as prescribed in *CCP-TP-045, S. 4.8* for test radiography. At least 7 were visible to EPA inspectors during this demonstration, and possibly as many as 10.

For each container undergoing examination, the operator first makes note of the drum number and the date and time on the audio/video recording before beginning radiography. The X-ray scan of the drum begins at the top where the operator identifies the seal and vent (if present), and the gauge markings that are attached magnetically to the outside of the drum.

The drum is rotated through at least 360 degrees so that all objects can be viewed from all sides. The operator has the ability to zoom both in and out and increase or decrease the scan energy in order to compensate for varying densities in the material examined. During examination, the operator also "rocks:" the drum when the bottom of the drum is reached to determine the presence of free liquids.

As part of the inspection, EPA observed the examination of three waste containers. EPA also reviewed videotaped scans of containers 6501-3-2 (BDR RLRTR0007), RHZ-108-A13671 (BDR RLRTR0024), 6000-5-15 (BDR RLRTR0010), and 0013666 (BDR RLRTR0002), respectively. Examination was conducted in accordance with established site procedures and the requirements for characterization contained in 40 CFR 194.24.

3) Documentation of radiography activities

Simultaneous audio descriptions and video recordings are made as the waste is examined. This was observed by EPA inspectors during the examination of three waste containers and further verified by review of RTR videotapes for the above referenced waste containers. A second operator inputs these data into an electronic RTR waste container data form.

4) Adequate documentation of radiography procedures

Radiography procedures are well defined and the documents are controlled. During the inspection, EPA reviewed the documentation and adequacy of all radiography-related procedures.

5) Training of radiography personnel

Procedure *CCP-TP-028, Revision 1, CCP Radiographic Test and Training Drum Requirements*, included all the requirements for content and set-up of the radiography test drum. Mr. Lee Smith (NDE Operator, ITR, TS, FQAO, SME/OJT) prepared the test drum. The test drum contained the requisite items specified in the regulations.

During the inspection, EPA reviewed documentation of the capability demonstration for all radiography personnel. Training records reviewed indicate that only trained personnel are operating the RTR equipment. Training documentation was complete and filed correctly for viewing and reference. The documents reviewed include:

- CCP Certification Letter for Aaron Chandler, CCP-QP-002-A2, Rev. 0
- CCP Certification Letter for Larry Lamb, CCP-QP-002-A2, Rev. 0
- CCP Certification Letter for Thad Hasselstrom, CCP-QP-002-A2, Rev. 0
- CCP Certification Letter for Steven Galbraith, CCP-QP-002-A2, Rev. 0
- CCP Certification Letter for Kenneth Dale Simpson, CCP-QP-002-A2, Rev. 0
- Hanford List of Qualified Individuals for NDA and NDE, dated 9/10/03

Specific questioning revealed that it is neither allowed, nor explicitly prohibited to stop the video recording during operator qualification testing on the test drum. The test drums are prepared by

the technical supervisor in accordance with Procedure *CCP-TP-028, Revision 1, CCP Radiographic Test and Training Drum Requirements*. Additionally, an RTR subject matter expert (SME) must be present during testing.

Findings:

The EPA inspectors did not have any findings as a result of the inspection of the Mobile RTR system at Hanford CCP.

Concerns:

RTR Concern No.1: EPA determined that RTR operator S. Galbraith was coached during his qualifying examination of the test drum. Operators are required to independently identify the items in the test drum. (CCP-PO-001, sec. B1-3b) EPA recommends that the observer monitoring the test remain silent with respect to the identification of the items contained in the test drum. This concern does not require a response.

RTR Concern No.2: EPA determined that waste inventories are being copied from the original electronic radiography data form to the data forms used for the Independent Observation (IO) and Replicate Scan (R). Further, EPA determined that waste inventories have been copied between operators when documenting examination of the test drum. EPA recommends that the operators conducting the IO and R complete each form individually, without access to the original data form. The original data form should only be used once the IO and R scans have been completed, and the data confirmation process is underway. Similarly, operators should not use waste inventory information from previously completed data forms during examination of the test drum. This concern does not require a response.

7.4 WIPP Waste Inventory System (WWIS)

The Hanford CCP program uses an excel spreadsheet and the WWIS system to perform basic data checks, transmit data, and receive confirmation, approval, or denial of waste data at the Hanford facility.

The following documents were examined during the EPA audit conducted September 8-12, 2003, to assess whether the WWIS at the Hanford facility is being adequately performed. EPA specifically examined the WWIS on September 10, 2003.

- CCP-TP-030, Revision 8, *CCP TRU Waste Certification and WWIS Data Entry*, 03/26/03.

EPA inspectors verified the technical elements of CCP's WWIS processes listed below. The checklist at Attachment A.4 identifies the objective evidence examined by EPA.

1) Overall procedural technical sufficiency and scope

The WWIS procedure, documented in *CCP-TP-030, Revision 8, CCP TRU Waste Certification and WWIS Data Entry*, contains specific information on entering, reviewing and transmitting of data, issuance of non-conformance reports, and technical review of data.

2) Documentation of WWIS activities

Waste data is entered into an Excel spreadsheet (Hanford Template.xls), which is the same template originally developed for the NTS (reviewed and approved by EPA), with modifications and updates to incorporate the TRUCON (Transuranic Content) codes likely to be encountered at Hanford, updated decay codes, and updated shipping codes for Hanford. Ms. Leanne Hackney (Waste Certification Official (WCO)) and Mr. J.R. Stroble demonstrated the data entry process, the quality control checks performed by the spreadsheet template, and the WWIS import, storage, and transmittal processes. The demonstration conformed to the requirements in the governing procedure.

Data storage was demonstrated. The file structure includes folders which are named for the particular waste stream containing individual files which are named for the batch number they contain. Each waste stream (file folder) can also be broken down into data "Lots" which contain approximately 30-40 batch reports. Waste review and certification is performed on a "Lot" basis. For the purposes of the inspection, surrogate data was entered to simulate actual data entry and review. At the time of the inspection, only one drum had completed NDA and NDE. That single drum was repackaged into two drums during the VE process.

Because Hanford already has an EPA approval to characterize and ship waste, Hanford CCP's program will only perform data entry and transmittal for wastes that they certify under the CCP program (Kerr-McGee waste in this case.) All Hanford waste (whether characterized by the site or CCP) will have a "RL" designation to allow them to be combined for shipment.

3) Adequate documentation of WWIS procedures

WWIS procedures are well defined and the documents are controlled. During the inspection, EPA reviewed the documentation and adequacy of all WWIS-related procedures.

4) Training of WWIS personnel

Actual job performance was observed in order to verify training and qualification of the WWIS personnel. A qual card system is used to document WWIS training that typically consists of procedure review and required reading like the WIPP WAC.

Findings:

EPA's inspectors did not have any findings as a result of the inspection of the WWIS.

Concerns:

EPA's inspectors did not have any concerns as a result of the inspection of the WWIS.

8.0 Response to Comments

EPA is seeking public comment on our site approval decision. Following a review and evaluation of public comments, EPA will finalize the proposed baseline compliance decision for the Hanford CCP.

9.0 Summary of Results

EPA's inspection team determined that the processes that were inspected characterize the following wastes in accordance with 40 CFR 194.24(c)(4) as follows:

- The AK process could not be fully assessed at the time of the audit because only a single container had been through the entire characterization process.
- The NDA systems are technically adequate and related processes are adequately implemented.
- The NDE system is technically adequate and related processes are adequately implemented.
- The WWIS process was adequately implemented.

During the September 2003 inspection, EPA's inspection team identified two (2) findings and five (5) concerns. During the post inspection review of the DOE-provided information, EPA identified two (2) additional concerns.

9.1 Findings

Since the September 2003 inspection DOE provided information to address the following two findings and we have determined that DOE has been able to address our findings sufficiently therefore, no outstanding findings remain to be resolved.

AK Finding No. 1: The AK process was inadequate with respect to supplemental data collection. The following technical topical areas were not adequately referenced for which appropriate supplemental information must be assembled and referenced in the AKS:

- Discrepancy Report D002 documents the combination of waste streams, but it does not specify the procedures, container-specific documents, or other records that support this determination (reference U001 does not directly address the issue, nor does U002).

  Resolution: Additional clarification concerning reasons the specific waste streams were broken out, including additional historical information was provided which indicated that the waste stream designation by Hanford CCP was adequate.

- Table 4 did not include references that show the original determination of the ratios and percentages presented therein, as well as adequate justification for these ratios.

Resolution: EPA obtained a full copy of CCP-AK-RL-001, Rev.1, revised in October 2003, after the audit, in June 2004. This document was revised to include a more detailed radiological characterization discussion in Section 5.4.2, which presented several new references not examined during the inspection. Specifically, References C014, P022, and P023 were new references added after the inspection and were therefore not available to EPA at the inspection. In addition a memorandum entitled "Evaluation of Kerr-McGee Fuel Production and FFTF History, June 2004" provided several additional source documents, which confirmed the material sourcing from Hanford to the Kerr McGee Facility. Therefore, the initial issue identified by EPA in this bullet has been resolved, and the information must be included in the AKS Report.

- The AKS must specifically indicate the full isotopic distribution of the waste stream, such as whether it includes less than 100 nCi/g material, and the generalized volume/percentage of the waste that is less than 100 nCi/g, etc.

  Resolution: Revision 1 of the AKS, prepared after the audit and obtained by EPA since site inspection, included new information in Section 4.3.5 which discusses screening measurement with respect to <100 nCi/g waste, and went on to indicate that low level waste was segregated from >100 nCi/g waste. Based on this information, it appears that the site has segregated low-level from TRU waste and has managed this waste as a separate waste stream. It is therefore assumed that no portion of the subject waste stream would fall in this category and DOE will not "load manage" (i.e. combine <100nCi/g waste with >100nCi/g waste in a TDOP). This issue has therefore been adequately resolved.

  If DOE identifies the need to "load manage" in the future, the AKS must be revised to address the <100nCi/g component with respect to management practices, etc, and the AKS should then be provided to EPA for review and approval.

- Correlations to the original feed material from PFP and references were not adequately included/integrated.

  Resolution: The issue presented in this bullet was adequately resolved by information provided to address issues presented in Bullet 2.

- The applicability of PFP $^{90}Sr/^{137}Cs$ ratio determinations with respect to Kerr McGee waste must be better presented that links to the PFP plant as the origin of feed material should be better presented and supported via reference. Further, since NDA personnel are directly using AK information, all CH-WAC confirmatory allowances for AK, and all CH-WAC requirements with respect to AK must be specifically addressed in the AKS Document.

  Resolution: The issue presented in this bullet was adequately resolved by information provided to address issues presented in Bullet 2.

- The AKS needs to present a generalized representation of the WMPs important to performance assessment, including ferrous metals, non-ferrous metals, cellulosics, plastics, and rubber. In addition, the AKS must present information pertinent to prohibited items such as water. It is understood that the various attachments may contain information, but these are not attached to the AKS Report. Procedure CCP-TP-005 must also require the collection of this information.

  Resolution: EPA was not provided the necessary waste material/matrix information in the additional references provided post inspection (i.e. C014), but EPA understands that the data are available on individual CIS. Because the appropriate information is available and can be provided in a summary table or form if need be, no revision of the AKS is necessary to address issue in this bullet.

- The AKS assumed that the decontamination activities that occurred at Kerr McGee and which generated the D&D waste in the Kerr McGee Cimarron waste stream also removed any contamination in the facility that resulted from production activities. However, this assumption was not well presented or adequately supported.

  Resolution: The post-inspection CBFO response provided to address this bullet was adequate.

AK Finding No. 2: The completeness and adequacy of the entire AK process could not be determined at the time of inspection because characterization data for only a single container was available. Only a single container had been through the entire characterization process, and "dummy" WSPF, CIS, and AK Accuracy reports were generated from information other than the Kerr McGee waste to demonstrate completion of the process. EPA has consistently required that more than a single container be completed so that the "dummy" forms can be based on actual data obtained, understanding that the final versions could differ because the SPM will likely wait to complete the "real" forms when even more containers are characterized. EPA shall reassess this issue when more container-specific data is obtained (three minimum), and when related reports are redone to reflect this information.

Resolution: With provision of additional batch reports following the conclusion of the inspection, the finding was resolved. Although no revised WSPFs and associated CIS, AK Accuracy reports, etc were provided, our experience has shown that Hanford CCP can adequately generate these documents.

9.2 Concerns

Two of the three AK concerns (AK Concern Nos. 1 and 2) and two RTR concerns (RTR Concern Nos. 1 and 2) raised during the inspection did not require any response; AK Concern No. 3 required a response. Post inspection DOE provided information which addressed AK concern nos. 1-3 and have been resolved satisfactorily. This additional information, however, resulted in two (2) additional concerns (AK Concern Nos. 4 and 5) listed below, neither of which requires a response.

AK Concern No. 1: AK and NDA personnel did not adequately communicate regarding data use. The AKE mistakenly assumed that NDA personnel were not directly using AK isotopic information as part of their measurement calculations, when, in fact, this was not the case. This lack of communication directly impacted how information was presented in the AKS, and assumptions on the part of the AKE resulted in the preparation of an AKS that lacked the necessary detail. The site must develop a better communication protocol whereby the use of AK data is adequately communicated between AK and NDA personnel.

Resolution: DOE characterized the lack of communication between AK and NDA an isolated issue. Interviews indicated that the AKE was completely unaware of AK use by the NDA personnel. The need for adequate communication has been recognized as Hanford CCP added Section 4.4.17 to CCP-TP-005, which mandates NDA-AK communication. EPA inspections at LANL and Lawrence Livermore (performed after Hanford CCP) showed this new requirement was being met by joint NDA-AK preparation of a formal memorandum indicating that both parties completely understood and agreed upon the use of AK with respect to AK. While the response to the AK concern presented in the CBFO response is inadequate, we have learned through EPA inspections performed after Hanford CCP that actual implementation of the mandatory AK-NDA communication is taking place. Therefore, the intent of the concern has been addressed.

AK Concern No. 2: As required for other sites, the site should track WMP outliers as part of the AK confirmation process (this could be done at the SPM level, if appropriate), thus ensuring that the preponderance of the waste stream corresponds with the WMC determinations a practice that was not implemented at the time of inspection. This concern does not require a response.

Resolution: As required for other sites, the site should track WMP outliers as part of the AK confirmation process (this could be done at the SPM level, if appropriate), thus ensuring that the preponderance of the waste stream corresponds with the WMC determinations a practice that was not implemented at the time of inspection. This concern did not require a response, and none was provided post inspection.

AK Concern No. 3: AK Accuracy determinations for the CCP program were not adequate with respect to radionuclides. AK accuracy, as cited in the WAP, requires comparison of radionuclide AK and measurement data, but it is non-specific with respect to how this is to be accomplished. In cases where AK data were used specifically as part of, in lieu of, or to directly support NDA measurements, the AK accuracy calculations must provide meaningful assessments of the use of this data to these ends. If, however, sites believe AK data does not provide this type of support, the AK accuracy assessment must reflect this level of AK use. The CCP procedure should be revised to recognize this distinction. This concern requires a response.

Resolution: The comment contained a typographical error; the WAC, not WAP requires AK-radionuclide data comparison. These comparisons must be meaningful. DOE should re-evaluate Hanford CCP's procedure with regard to AK accuracy calculations for radionuclides, as this comparison gains importance when sites seek to use AK more and more as the basis for characterization. Since CCP program is not longer active at Hanford this outstanding concern no

longer requires a response. If the CCP resumes work at Hanford PFP AK accuracy calculation procedures should be revised prior to implementation of the procedure.

AK Concern No. 4. DOE provided significant supporting information in post-inspection responses provided to EPA. We examined the data and found it to satisfactorily address many of the issues, but we also expect this information to be included in the AKS. The following information must be included in the AKS:

- Additional documentation concerning the source of Kerr McGee material (AK Finding, Bullet 2).
- Documentation of intent to waste load, if CCP ever decides to perform this activity (AK Finding, Bullet 3).
- Necessary waste material/matrix information as presented in AK Finding 1, Bullet 5 based upon Contents Inventory Sheets.
- Decontamination and D&D information as presented in the response to AK Finding 1, Bullet 6.
- Results of the AK Memo mandated in Section 4.4.17 of CCP-TP-005, and inclusion of this memo in the AK record, which address concerns expressed in the previously identified in First AK Concerns 1 and 2.
- Meaningful AK-radionuclide data comparisons, as expressed in First AK Concern No. 4.

This concern does not require a response.

AK Concern No. 5: As required for other sites, the site should track WMP outliers as part of the AK confirmation process (this could be done at the SPM level, if appropriate), thus ensuring that the preponderance of the waste stream corresponds with the WMC determinations a practice that was not implemented at the time of inspection. This concern does not require a response.

RTR Concern No. 1: EPA determined that RTR operator S. Galbraith was coached during his qualifying examination of the test drum. Operators are required to successfully identify the items in the test drum. (CCP-PO-001, sec. B1-3b) EPA recommends that the observer monitoring the test remain silent with respect to the identification of the items contained in the test drum. This concern does not require a response.

RTR Concern No. 2: EPA determined that waste inventories are being copied from the original electronic radiography data form to the data forms used for the Independent Observation (IO) and Replicate Scan (R). Further, EPA determined that waste inventories have been copied between operators when documenting examination of the test drum. EPA recommends that the operators conducting the IO and R complete each form individually, without access to the original data form. The original data form should only be used once the IO and R scans have been completed, and the data confirmation process is underway. Similarly, operators should not use waste inventory information from previously completed data forms during examination of the test drum. This concern does not require a response.

9.3 Baseline Inspection Decision

Based on the inspection results and post-inspection information, has determined that the Hanford CCP can adequately characterize retrievably-stored, CH debris waste using the WC systems and processes discussed in this report.

EPA is proposing to approve AK, NDA using the Mobile SGS, NDE using RTR, and WWIS processes implemented by CCP at Hanford PFP when characterizing retrievably-stored, CH TRU debris waste and evaluated by us during the inspection. Visual examination was not evaluated as part of this inspection. Hanford site did visual examination of the waste stream using the previously approved VE processes. CCP demonstrated adequately its capabilities to characterize retrievably-stored CH TRU debris waste using these WC processes.

EPA is proposing a Tier 1 designation for any changes to the Hanford CCP waste characterization processes discussed in this report. This means that DOE must obtain written approval from EPA prior to using any new revised processes, equipment, or waste streams. Because CCP operations at Hanford have concluded, we do not expect any changes or expansion to its waste characterization program we evaluated during September 2003 inspection. Therefore, for efficiency and simplicity, we are categorizing any and all changes to these processes as Tier 1. If the CCP program were to be re-deployed a new baselne compliance inspection will be necessary. The table below summarizes EPA approvals of CCP's waste characterization processes.

Table - Summary of EPA Approvals

Waste Characterization Element	PFP Debris Waste	PFP Solid Waste
AK	Approved	Not approved
NDA	Approved – SGS	Not approved
NDE	Approved – RTR Approved – VE*	Not approved Not approved
WWIS	Approved	Not approved
Load Management	Not approved	Not approved

* - VE of the PFP debris waste not performed by CCP but was done by the Hanford using their approved VE procedures.

Attachment A.1
Acceptable Knowledge (AK) Checklist for Inspection EPA- Hanford-CCP-09.03-8 September 8-12 at Hanford Site

Attachment A.2
Nondestructive Assay (NDA) Checklist for Inspection EPA- Hanford-CCP-09.03-8 September 8-12 at Hanford Site

Attachment A.3
Nondestructive Examination (NDE) Checklist for Inspection EPA- Hanford-CCP-09.03-8 September 8-12 at Hanford Site

Attachment A.4
WIPP Waste Inventory System (WWIS) Checklist for Inspection EPA- Hanford-CCP-09.03-8 September 8-12 at Hanford Site

Attachment A.4.1
WWIS Data Requirements

Attachment B.1
Replicate Test Data for Container 0013652 Assayed on the SGS

Attachment B.2
Replicate Test Results for Container 0013652 Assayed on the SGS

Attachment B.3
Replicate Test Data for Container 0013665 Assayed on the SGS

Attachment B.4
Replicate Test Results for Container 0013665 Assayed on the SGS

Attachment B.5
Replicate Test Data for Container 6000-5-15 Assayed on the SGS

Attachment B.6
Replicate Test Results for Container 6000-5-15 Assayed on the SGS

A.1 - Acceptable Knowledge (AK) Checklist for Inspection EPA- Hanford-CCP-09.03-8
September 8-12, 2003, at Hanford Site

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
Procedures require staff to be: • familiar with applicable technical procedures • familiar with QAOs • qualified to assemble, compile, and confirm AK data	CCP-QP-002	• Employee's explanation of job duties was consistent with applicable procedures • Employee could identify the mandatory AK items for assembly • Employee's identification of applicable procedures was correct • Employee adequately explained how to assemble, compile, and confirm data • Employees responsible for AK documentation were trained and qualified in accordance with applicable procedures	Y	Training and Qualification, August 11, 2003 surveillance; training records for Kevin Peters and Mark Doherty. Personnel understood job duties and could identify mandatory information needs/procedures. It was noted that periodic retraining is not required for AK personnel, and this should be considered.
Procedures demonstrate a logical progression from general facility information to more detailed waste stream-specific information.	CCP-TP-005 Rev 12	This logical sequence can be demonstrated through traceability analysis. (Traceability analysis and linkages may include but need not be limited to individual container data for radionuclides and waste material parameters, IDCs, and waste streams.) AK documentation is traceable to the drum level.	I	CCP-AK-RL-001, Rev0; P001, P004, Contents Inventory Data Sheet, Container 651-1-21, P002, C001, P003, RLMKMD.001 WSPF (draft), BDRS 001474, 13343; RLNDA0016, The traceability and, hence, completeness of the characterization process could not be completed because an adequate number of containers had not yet been characterized at the time of the inspection.
Procedures for AK processes are consistent with each other.	CCP-TP-005 Rev 12	Procedures for AK processes are implemented consistently.	Y	Single procedure deals with AK.
The site's TRU waste management program has procedures to determine: • waste categorization schemes (e.g., consistent definitions of waste streams) and terminology • breakdown of the types and quantities of TRU waste generated/stored at the site • how waste is tracked and managed at the generator site (including historical and current operations)	CCP-TP-005 Rev 12			CCP-AK-RL-001 Rev.0, Contents Inventory Sheets, Solid Waste Storage Records, U002, D001. Waste categorization/waste stream identification appears adequate although WMC outliers should be tracked. AK record must include WMC calculations. Waste is tracked through SWITS database at Hanford Site. Note that site must also include breakdown of LL vs.TRU waste in each waste stream description.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
Procedures call for AK information to be collected for: • ^{241}Am, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{233}U, ^{234}U, ^{238}U, ^{90}Sr, ^{137}Cs + unexpected radionuclides • ferrous metals (in containers) • cellulosics, plastics, rubber • nonferrous metals (in containers) From CH WAC: 1. Specify isotopes/quantities defined by AK –Must be appropriate and result in unbiased values for cumulative activity and mass of radionuclides	CCP-TP-005 Rev 12	AK information is collected for: • ^{241}Am, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{233}U, ^{234}U, ^{238}U, ^{90}Sr, ^{137}Cs + unexpected radionuclides • ferrous metals (in containers) • cellulosics, plastics, rubber • nonferrous metals (in containers) From CH WAC: Is AK information collected for isotopes?	N	CCP-AK-RL-001 Rev.0, Poo1, Poo4, P002, Attachment 7, C002, U001, U002. The site collected waste material parameter information for determination of waste matrix code, but neither the procedure nor document specified the collection of these waste material parameter data. Additionally, the collection of radionuclide data with respect to isotopic distribution was based on a single document, U001, and no information supporting the isotopic distribution was included in the AK record at the time of inspection. Therefore, it cannot be concluded that the isotopic data were adequate for its intended use, based on information available at the audit.
Procedures require documentation of radionuclide process origin.	CCP-TP-005 Rev 12	Identified radionuclides and their isotopic distributions are consistent and accurate.	N	CCP-AK-RL-001 Rev.0, P002, P004, P005, P006, U002. While the CCP program had a lot of information pertaining to D and D of the Kerr McGee facility, there was no critical link between PFP operations and the source material to the Kerr McGee processes. This information must be identified and include in the AK record.
		Radionuclides identified by AK and isotopic distributions are provided to NDA/Radioassay personnel. If AK data are provided to NDA personnel, data are available to operators prior to determination of isotopic quantities. Data use and limitations are well defined (refer to NDA checklist).	N	CCP-AK-RL-001 Rev.0, O001, P002, P003, P004, U001, U002 AK personnel indicated that AK information was not used by NDA personnel for direct use/input in NDA. However, NDA personnel did use this information, which was not recognized by the AK program nor adequately supported by AK documentation. Additionally, data limitations with respect to AK must be better defined so that anyone reading the AK documentation understands those data limitations.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
Procedures require: • Assembling AK information • Compiling AK documentation into an auditable record (the process should include review of AK information to determine the waste material parameters and radionuclides present, as well as source info discrepancy resolution) • Assigning waste streams/waste matrix codes • Identifying physical forms, waste material parameters, and radionuclides (including, if possible, isotopic ratios) • Resolving data discrepancies • Identifying management controls for discrepant items/containers/waste streams. • Confirming AK information with other analytical results (done by comparing AK characterization data with that obtained through NDE and/or visual examination, including discrepancy resolution). • Auditing of AK records.	CCP-TP-005 Rev 12, CCP-TP-03, Rev 13	Compilation of AK documentation is adequately demonstrated. Discrepancies are adequately resolved.	N	CCP-AK-RL-001 Rev.0, C001, C002, P001, P002, P003, P004, P005, P006, U001, U002, D002, D002 Batch Data Reports; "dummy" AK Accuracy reports; WSPF for Waste Stream RLMKMD.001 The CCP program personnel assembled what they believed to be adequate documentation to support the intended use of AK (i.e. mandatory information), but failed to communicate limitations to NDA personnel and did not collect adequate supplemental AK data. Data discrepancies appear to be adequately resolved. Physical waste forms (i.e. waste material parameters and prohibited items) were not adequately identified in the AK record, but the WMC assignment appears adequate. Confirmation could not be assessed because only a single container had undergone the characterization process and therefore WSPF, programmatic data reconciliation, CIS, and AK Accuracy could not be completed for the actual Kerr McGee waste.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
From CH-WAC 1. If AK used (i.e.data collected prior to QA program)-what method was employed to qualify-peer review, corroborating data, confirmatory testing, QA program equivalency? 2. At a minimum, to confirm existing AK data, it is necessary to compare ratios of the two most prevalent radionuclides in the isotopic mix <u>2. 238, 239, 240, 241, 242 Pu and 241Am:</u> -Confirmation can be accomplished via comparison of measured and AK values for ^{239} Pu/ ^{240} Pu for wgpu; ^{238}Pu/ ^{239}Pu for heat source. - Measured ^{241}Am can be used to calculate 241Pu (for subsequent AK comparison) if time of chemical separation is known (no ^{241}Am at time of separation assumed) - ^{241}Pu can be compared (by ratio) to confirm AK of any Pu isotope associated with wg/rg (i.e.^{239}Pu or ^{240} Pu) - ^{238}Pu from AK for wg/rg Pu is assumed to be valid if the AK values of ^{239}Pu and ^{240}Pu have been confirmed by measurement. -^{242}Pu calculated by correlation techniques since it can't be measured	CCP-TP-005 Rev 12	AK confirmation based on NDE and/or visual examination is adequately demonstrated.	N	CCP-AK-RL-001 Rev.0, U001, U002. AK Personnel did not perform adequate supplemental/supporting data acquisition with respect to radionuclide information. None of the confirmation allowance in the CH WAC were presented in the AK Summary, and should be addressed since the AK data are being used directly by NDA personnel. Specific use of AK isotopic data must be referenced, and the use of AK confirmatory comparisons addressed. Any use of default isotopics or non-measurement derived values must be clearly explained.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
3. 235U, 233U, 238U, 234U Were they tracked or measured in AK information? -If no valid AK exists, data generated can only be used to detect or calculate, or confirm absence - ratios for ^{234}U calculated from ^{235}U enrichment - If valid AK exists can confirm with certified systems -^{234}U calculated by ^{235}U enrichment because ^{234}U can't be measured 4. ^{137} Cs and ^{90} Sr -confirmed by WIPP certified system (direct measurement or comparison of ^{241}Am peak at 662 kv to other ^{241}Am peaks (disproportionate ^{241}Am peak at 662 kv could mean presence of ^{137}Cs) - 90 Sr calculated from ^{137}Cs using scaling factors 5. Other radionuclides- must identify via NDA and should identify via AK	CCP-TP-005 Rev 12		N	See above.
Procedures require that: • AK information be compiled in an auditable record, including a road map for all applicable information. • A reference list be provided that identifies documents, databases, Quality Assurance protocols, and other sources of information that support AK information. • The overview of the facility and TRU waste management operations in the context of the facility's mission be correlated to specific waste stream information. • Correlations between waste streams, with regard to time of generation, waste generating processes, and site-specific facilities be clearly described. For newly generated wastes, the rate and quantity of waste to be generated shall be defined. • Nonconforming waste be segregated.	CCP-TP-005 Rev 12	• AK information is compiled in an auditable record, including a road map for all applicable information. • A reference list is provided that identifies documents, databases, Quality Assurance protocols, and other sources of information that support AK information. • The overview of the facility and TRU waste management operations in the context of the facility's mission is correlated to specific waste stream information. • Correlations between waste streams, with regard to time of generation, waste generating processes, and site-specific facilities is clearly described. For newly generated wastes, the rate and quantity of waste to be generated are defined. • Nonconforming waste is segregated.	Y, part	CCP-AK-RL-001 Rev.0. Attachment 4 is the AK roadmap, and is adequate. The reference list, however, does not include adequate supplemental information. The overview of the Kerr-McGee facility is adequate, but the CCP program did not adequately document input materials from PFP to Kerr McGee, or how or if the Kerr McGee activities were defense related. Waste stream generation information appears adequate, although linkages between activities performed at the site and ultimate potential contamination generated during D and D is very weak. Nonconforming wastes appear to be segregated (i.e. wastes identified via NDE as having opaque areas are segregated for VE).

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
Procedures require that the following information will be included in the AK record: • Map of the site that identifies the areas and facilities involved in TRU waste generation, treatment, and storage • Facility mission description related to TRU waste generation and management • Description of the operations that generate TRU waste at the site and process information, including: -Area(s) or building(s) from which the waste stream was or is generated -Estimated waste stream volume and time period of generation -Waste generating process description for each building or area -Process flow diagrams, if appropriate -Generalized material inputs or other information that identifies the radionuclide content of the waste stream and the physical waste form • Types and quantities of TRU waste generated, including historical generation through future projections From CH-WAC 1 waste identification/categorization schemes relevant to the isotopic composition of waste and description of isotopic composition of each waste stream 2 physical/chemical waste composition that could affect isotopic distribution (i.e. processes to remove ingrown 241am) 3 statement of all numerical adjustments applied to derive the material's isotopic distribution e.g. scaling factors, decay/ingrowth corrections and secular equilibrium considerations 4 specification of isotopic ratios for the 10 WIPP-tracked radionuclides and, if applicable, the radionuclides that comprise 95% of the hazard	CCP-TP-005 Rev 12	The following information is included in the AK record: • Map of the site that identifies the areas and facilities involved in TRU waste generation, treatment, and storage • Facility mission description related to TRU waste generation and management • Description of the operations that generate TRU waste at the site and process information, including: -Area(s) or building(s) from which the waste stream was or is generated -Estimated waste stream volume and time period of generation -Waste generating process description for each building or area -Process flow diagrams, if appropriate -Generalized material inputs or other information that identifies the radionuclide content of the waste stream and the physical waste form • Types and quantities of TRU waste generated, including historical generation through future projections From CH-WAC 1 waste identification/categorization schemes relevant to the isotopic composition of waste and description of isotopic composition of each waste stream 2 physical/chemical waste composition that could affect isotopic distribution (i.e. processes to remove ingrown 241am) 3 statement of all numerical adjustments applied to derive the material's isotopic distribution e.g. scaling factors, decay/ingrowth corrections and secular equilibrium considerations 4 specification of isotopic ratios for the 10 WIPP-tracked radionuclides and, if applicable, the radionuclides that comprise 95% of the hazard	N	CCP-AK-RL-001 Rev.0, C002, P001, P002, P003, P004, P005, P006, U001, U002, D002, D002 Batch Data Reports; "dummy" AK Accuracy reports; WSPF for Waste Stream RLMKMD.001 Mandatory/general information was available, but linkages between process material input origin and assumed waste outputs are not in the AK record. None of the CH WAC required information such as categorization with respect to isotopic distribution, numeric adjustments, etc. are adequately addressed, particularly since the CCP program did not adequately support the isotopic distribution presented in the AK Summary.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
The site has procedures for the collection of supplemental information.	CCP-TP-005 Rev 12	Samples of supplemental information are sufficiently detailed and are appropriate to the waste being characterized. From CH-WAC Examples of supplemental information include: 1 safeguards and security and other material control systems/programs 2 reports of nuclear safety or criticality, accidents involving SNM 3 waste packaging, waste disposal, building or nuclear material management area logs or inventory records, site databases that provide SNM or nuclear material information 4 test plans, research project reports, or laboratory notebooks that describe the radionuclide content of materials used in experiments 5 information from site personnel 6 historical analytical data relevant to isotopic distribution of the waste stream	N	CCP-AK-RL-001 Rev.0, C002, P001, P002, P003, P004, P005, P006, U001, U002, D002, D002 Batch Data Reports; "dummy" AK Accuracy reports; WSPF for Waste Stream RLMKMD.001 Collection of supplemental information was inadequate. AKE relied on only higher tier documents for generalized information stating that this was "enough", but requirements mandate at least minimal checking of this information to ensure that generalized data, often collected for non-waste characterization purposes, is satisfactory. This was not accomplished. Safeguards/security data, reports of nuclear safety, test plans, information from site personnel, etc were not collected.
Site documents/procedures require the facility prepare an AK summary document that summarizes all information collected, including the basis for all waste stream designations.	CCP-TP-005 Rev 12	The AK summary is available for EPA review and contains the required information, including the basis for all waste stream designations.	Y	CCP-AK-RL-001 Rev.0. AK Summary was prepared; see comments above for deficiencies associated with the AK Summary.
Site procedures require that additional information be collected before waste may be shipped if the required AK information is not available for a waste stream.	CCP-TP-005 Rev 12	Additional information is collected before waste may be shipped if the required AK information is not available for a waste stream.	Y	CCP-AK-RL-001 Rev.0. To date, CCP states that adequate information has been available.
The site has a written procedure for the confirmation of AK information using analytical data, including NDA/NDE and/or VE. This procedure applies to both retrievably stored and newly generated waste. This procedure requires a reevaluation of AK if NDE/NDA or VE identify it to be a different waste matrix code. This procedure describes how the waste must be reassigned, based on the AK reevaluation.	CCP-TP-005 Rev 12	AK information is confirmed using analytical data, including NDA/NDE and/or VE. Has the acceptable knowledge expert calculated the percent changes in matrix parameter categories (MPCs) based on AK and NDE/VE? Were accuracy evaluations assigned? Are these acceptable?	N	CCP-AK-RL-001 Rev.0. AK Accuracy Report Attachment 11. Confirmation was not completed at the time of the inspection. Site must track WMC outliers to ensure that the preponderance of waste in the waste stream matches the WMC. AK accuracy must be revised to reflect the intended us of the data with respect to radionuclide/isotopic comparisons.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comment
Procedures require the following steps to be followed if wastes are reassigned to a different waste matrix code based on NDA/NDE or VE: • Review existing information based on the container identification number and document all differences • Reassess and document all analytical data associated with the waste • Reevaluate waste material parameter determinations and document any changes • Reevaluate the radionuclide content and document any changes • Verify and document that the reassigned waste matrix code was generated within the specified time period, area and buildings, waste generating process, and that the process material inputs are consistent with the waste material parameters identified during radiography or visual examination • Record all changes to acceptable knowledge records • If discrepancies exist in the acceptable knowledge information for the reassigned waste matrix code, complete a nonconformance report, document the segregation of this container, and define the corrective actions necessary to fully characterize the waste	CCP-TP-005 Rev 12	The following steps are followed if wastes are reassigned to a different waste matrix code: • Review existing information based on the container identification number and document all differences • Reassess and document all analytical data associated with the waste • Reevaluate waste material parameter determinations and document any changes • Reevaluate the radionuclide content and document any changes • Verify and document that the reassigned waste matrix code was generated within the specified time period, area and buildings, waste generating process, and that the process material inputs are consistent with the waste material parameters identified during radiography or visual examination • Record all changes to acceptable knowledge records • If discrepancies exist in the acceptable knowledge information for the reassigned waste matrix code, complete a nonconformance report, document the segregation of this container, and define the corrective actions necessary to fully characterize the waste	Y	CCP-AK-RL-001 Rev.0. Has not been implemented yet, so no objective evidence to this end was available
The site has procedures for shipment revocation and procedures for notification of CAO when a container is revoked?	CCP-TP-005 Rev 12	Has a waste stream been revoked based either on AK information or reassessment as part of reconfirmation? If so, was the procedure(s) followed?	Y	No CCP shipments have occurred; no revocation.
Until discrepancies are resolved, shipment of the waste stream to the WIPP is prohibited.	CCP-TP-005 Rev 12	If data consistently indicate discrepancies with acceptable knowledge information, the site increases sampling, reassesses the materials and processes that generate the waste, and resubmits waste stream profile information.	Y	Note that the AKE stated that almost all containers have received NCRs at RTR due to “opaque areas”, so almost all packages will need to be repackaged and potentially reassayed.

A.2 - Nondestructive Assay (NDA) Checklist for Inspection EPA- Hanford-CCP-09.03-8
September 8-12, 2003, at Hanford Site

Establishment of Required Elements in Procedures	Y/N	Location	Execution of Procedures or Verification of Activity	Y/N	Objective Evidence or Comment
General Reporting Requirements					
Procedures require assay systems to report quantitative values and uncertainties for ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{241}Am, ^{233}U, ^{234}U, ^{238}U, ^{90}Sr, and ^{137}Cs.	Y	CCP-PO-002, Revision 6, Section A.1 (Page 82)	Quantitative values and uncertainties for ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{241}Am, ^{233}U, ^{234}U, ^{238}U, ^{90}Sr, and ^{137}Cs are reported.	Y	Reviewed Batch Data Reports RLNDA0001, RLNDA0002, RLNDA0003, and RLNDA0016.
Procedures require that each container disposed of at WIPP contains TRU waste.	Y	CCP-PO-002, Revision 6, Section A.1 (Page 82)	Containers to be disposed of at WIPP meet the definition of TRU waste.	Y	Payload containers meet the definition of TRU waste when the TRU alpha concentration exceeds 100 nCi/g.
NDA instruments and procedures are appropriate for the waste streams and/or waste content codes being assayed.	Y	CCP-PO-002, Revision 6, Section A.1 (Page 83)	NDA instruments and procedures are appropriate for the waste streams and/or waste content codes being assayed.	Y	SGS is appropriate for characterizing heterogeneous waste.
NDA instruments and procedures result in unbiased values for the cumulative activity of the WIPP radionuclide inventory.	Y	CCP-PO-002, Revision 6, Section A.1 (Page 83)	NDA instruments and procedures result in unbiased values for the cumulative activity of the WIPP radionuclide inventory.	Y	Reviewed calibration report MCS-HANF-NDA-1010, *Calibration and Validation Report for the Gamma Scanner at the Hanford Site*, Revision 0.
Acceptable Knowledge (AK)					
Isotopic ratios for use in qualifying radionuclides are performed by direct measurement or, when AK is used, are qualified by confirmatory testing.	Y	CCP-PO-002, Revision 6, Section A.2 (Page 84)	Isotopic ratios for use in quantifying radionuclides are performed by direct measurement or, when AK is used, are qualified by confirmatory testing.	Y	Isotopic ratios are measured using Multi-Group Analysis (MGA). Default isotopic ratios are applied during ETR if MGA fails.
Lower Level of Detection					
Procedures require that the lower limit of detection (LLD) for each NDA system is determined.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	The lower limit of detection (LLD) for each NDA system has been determined.	Y	The determination of the minimum detectable activity (MDA) or LLD is documented in MCS-HANF-NDA-1010, *Calibration and Validation Report for the Gamma Scanner at the Hanford Site*, Revision 0.
NDA instruments performing TRU/low-level waste discrimination measurements are required to have a LLD no greater than 100 nCi/g.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	NDA instruments performing TRU/low-level waste discrimination measurements are required to have a LLD no greater than 100 nCi/g.	Y	The LLD (or MDC) is calculated for each measurement based on the measured background, efficiency, and the mass of the waste matrix.
Procedures require that site specific environmental backgrounds and container specific interferences must be accounted for in LLD determinations.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	Site-specific environmental backgrounds and container specific interferences are accounted for in LLD determinations.	Y	The reported LLD for each measurement is based on the background at the time of assay and the

Establishment of Required Elements in Procedures	Y/N	Location	Execution of Procedures or Verification of Activity	Y/N	Objective Evidence or Comment
Total Measurement Uncertainty (TMU)					
The method used to calculate the total measurement uncertainty (TMU) for all required quantities must be documented and technically justified.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	The method used to calculate the total measurement uncertainty (TMU) for all required quantities are documented and technically justified.	Y	TMU determination is documented in CI-SGS-TMU, *Total Measurement Uncertainty for the MCS Segmented Gamma Scanner*, Revision 3.0
Methods to determine TMU must be reviewed and approved by CBFO for each NDA instrument.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	Methods to determine TMU have been reviewed and approved by CBFO for each NDA instrument.	Y	Confirmed by discussion with CBFO Technical Specialist.
Calibration					
Procedures require that each NDA instrument is calibrated before its initial use.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	The NDA instrument has been calibrated before its initial use.	Y	Calibration was performed at Nevada Test Site (NTS) and verified at Hanford.
Site procedures must specify the range of applicability of system calibrations.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	The range of applicability of system calibrations has been specified.	Y	The operating range of the system is defined as 0.1 to 200 g WGPu. Calibration is applicable to low Z materials, including heterogeneous debris.
Procedures require that any matrix/source surrogate waste combinations are representative of the activity ranges and relevant waste matrix characteristics (i.e. densities, effective atomic number, neutron absorber and moderator content) planned for measurement by the system.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 90)	Matrix/source surrogate waste combinations used are representative of the activity ranges and relevant waste matrix characteristics planned for measurement by the system.	Y	Six mixed isotope line sources (^{241}Am, ^{133}Ba, ^{137}Cs, ^{60}Co) used in a surrogate foam matrix with a density of 0.031 g/cm^3.
Procedures require the use of consensus standards, when such standards exist. If consensus standards do not exist, the calibration technique must be approved by CBFO.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	Consensus standards have been used, when such standards exist. If consensus standards do not exist, the calibration technique has been approved by CBFO.	Y	Six mixed isotope line sources (^{241}Am, ^{133}Ba, ^{137}Cs, ^{60}Co) used have been calibrated against NIST traceable sources. Certificates included in MCS-HANF-NDA-1010, *Calibration and Validation Report for the Gamma Scanner at the Hanford Site*, Revision 0
Procedures require that primary standards be obtained from suppliers maintaining a nationally accredited measurement program.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	Primary standards have been obtained from suppliers maintaining a nationally accredited measurement program.	Y	Sources acquired from North American Scientific, Inc.
Calibration Verification					
Procedures require that verification of an NDA instrument's calibration is performed after any of the following occurrences: major system repairs and/or modifications, replacement of the system's components, significant changes to the system's software, and relocation of the system.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	Verification of an NDA instrument's calibration has been performed when required.	Y	Calibration verified after relocation from NTS to Hanford. Calibration verification documented in MCS-HANF-NDA-1010, *Calibration and Validation*

Establishment of Required Elements in Procedures	Y/N	Location	Execution of Procedures or Verification of Activity	Y/N	Objective Evidence or Comment
					Report for the Gamma Scanner at the Hanford Site, Revision 0
Procedures require recalibration of the system if the calibration verification demonstrates that the system's response has significantly changed.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	Recalibration of the system has been performed if the calibration verification demonstrates that the system's response has significantly changed.	Y	Re-calibration has not been required.
Calibration Confirmation					
Procedures require confirmation of the calibration of a system by performing replicate measurements of a non-interfering matrix.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	The calibration of a system has been confirmed by performing replicate measurements of a non-interfering matrix.	Y	Calibration confirmation performed by making replicate measurements of WGPu sources in a PDP combustibles matrix
Procedures require that replicate measurements be performed with containers of the same nominal size as those used for actual waste assays.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	Replicate measurements have been performed with containers of the same nominal size as those used for actual waste assays.	Y	PDP combustible drum is a 55-gallon drum, of the same nominal size as the drums routinely assayed.
Procedures require that replicate measurements be performed according to the same procedures used for actual waste assays.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	Replicate measurements have been performed according to the same procedures used for actual waste assays.	Y	Software and procedures used for calibration confirmation are the same as those used for routine measurements.
Procedures require that replicate measurements be performed using nationally recognized standards or standards derived from nationally recognized standards that span the range of use of the instrument.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	Replicate measurements have been performed using nationally recognized standards or standards derived from nationally recognized standards that span the range of use of the instrument.	Y	WGPu PDP sources with total mass loadings of 33, 100, and 166 g used.
Procedures require that the standards used for calibration confirmation are not the same sources for the most recent calibration.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 91)	The standards used for calibration confirmation are not the same sources for the most recent calibration.	Y	Mixed isotope (^{241}Am, ^{133}Ba, ^{137}Cs, ^{60}Co) used for calibration. WGPu PDP sources used for calibration confirmation.
Requirements for accuracy, expressed as %R, and precision, expressed as %RSD, must be met.	Y	CCP-PO-002, Revision 6, Section A.3 (Page 92)	Requirements for accuracy and precision have been met.	Y	Results are documented in MCS-HANF-NDA-1010, *Calibration and Validation Report for the Gamma Scanner at the Hanford Site*, Revision 0
General Quality Control					
Procedures require that all radioassay and data validation be performed by appropriately trained and qualified personnel.	Y	CCP-PO-002, Revision 6, Section A.4.1 (Page 94)	All radioassay and data validation has been performed by appropriately trained and qualified personnel.		
Procedures require that re-qualification of personnel be based on evidence of continued satisfactory performance and is performed at least every two years.	Y	CCP-PO-002, Revision 6, Section A.4.1 (Page 94)	Re-qualification of personnel be based on evidence of continued satisfactory performance has been performed at least every two years.		
Procedures require that all computer programs, including spreadsheets used for data reduction	Y	CCP-PO-002, Revision 6, Section A.4.1 (Page 94)	All computer programs, including spreadsheets used for data reduction or	Y	Software includes Genie-PC Gamma Waste Assay

Establishment of Required Elements in Procedures	Y/N	Location	Execution of Procedures or Verification of Activity	Y/N	Objective Evidence or Comment
or analysis, meet the applicable requirements in the QAPD.			analysis, meet the applicable requirements in the QAPD.		(GWAS) Software.
Procedures require that site participate in any relevant measurement comparison programs sponsored or approved by CBFO, including the Performance Demonstration Program (PDP).	Y	CCP-PO-002, Revision 6, Section A.4.1 (Page 94)	The site has participated in relevant measurement comparison programs sponsored or approved by CBFO.	Y	SGS passed PDP Cycle 8C (Combustibles & Metals) and Cycle 9 (Combustibles & Glass). SGS participated in Cycle 10 (Results pending).
Background and Performance Checks					
Procedures require daily background measurements, unless otherwise approved by CBFO. Contributions to backgrounds from nearby radiation sources must be carefully controlled, or more frequent backgrounds must be measured.	Y	CCP-PO-002, Revision 6, Section A.4.2 (Page 95)	Daily background measurements have been taken, unless otherwise approved by CBFO. Contributions to backgrounds from nearby radiation sources have been carefully controlled.	Y	Background count rate measured each operational day. Reviewed Batch Data Reports RLNDA0001, RLNDA0002, RLNDA0003, and RLNDA0016.
Procedures require that system performance checks be performed at least once per operational day.	Y	CCP-PO-002, Revision 6, Section A.4.2 (Page 95)	Performance checks have been performed at least once per operational day.	Y	Reviewed Batch Data Reports RLNDA0001, RLNDA0002, RLNDA0003, and RLNDA0016.
System performance checks must include, as applicable, efficiency, matrix correction checks, and for spectrometry systems peak position and resolution.	Y	CCP-PO-002, Revision 6, Section A.4.2 (Page 95)	Performance checks include, as applicable, efficiency, matrix correction checks, and for spectrometry systems peak position and resolution.	Y	Performance checks include peak centroid, HWHM, and count rate at 356 keV; peak centroid and FWHM at 81 keV.
Procedures require that at least once per operational week an interfering matrix is used to assess the long term stability of the NDA instrument and its matrix corrections.	Y	CCP-PO-002, Revision 6, Section A.4.2 (Page 95)	An interfering matrix is used to assess the long term stability of the NDA instrument and its matrix corrections at least once per operational week.	Y	Weekly interfering matrix checks include 5 g ^{239}Pu in a combustibles matrix (density of 0.26 g/cm^3) and 150 g ^{239}Pu in a combustibles and sand matrix (density of 0.75 g/cm^3).
Procedures require that interfering surrogate waste matrices be constructed in a way that the matrix characteristics do not change over time.	Y	CCP-PO-002, Revision 6, Section A.4.2 (Page 95)	Interfering surrogate waste matrices have been constructed in a way that the matrix characteristics do not change over time.	Y	Discussion of drum construction with Hanford personnel.
Procedures require that sources used for performance checks either be long-lived or decay-corrected.	Y	CCP-PO-002, Revision 6, Section A.4.2 (Page 95)	Sources used for performance checks either are long-lived or decay-corrected.	Y	^{133}Ba transmission source and ^{137}Cs source used. Activities are decay corrected.
Procedures require that performance checks be quantitative and based on 2 and 3 sigma limits.	Y	CCP-PO-002, Revision 6, Section A.4.2 (Page 96)	Performance checks are quantitative and based on 2 and 3 sigma limits.	Y	See Section 6 of MCS-HANF-NDA-1000, *Calibration and Validation Test Plan for the MCS SGS at the Hanford Site*, Revision 0a.
Data Management					
Procedures require that all radioassay data be reviewed and approved by qualified personnel before being reported to WWIS.		CCP-PO-002, Revision 6, Section A.4.5.1 (Page 99)	All radioassay data has been reviewed and approved by qualified personnel before being reported to WWIS.	Y	Reviewed Batch Data Reports RLNDA0001, RLNDA0002, RLNDA0003, and RLNDA0016.
Procedures require that radioassay testing batch reports consist of the following:	Y	CCP-PO-002, Revision 6, Section A.4.5.2 (Page 99)	Radioassay testing batch reports consist of the following:	Y	Reviewed Batch Data Reports RLNDA0001, RLNDA0002,

Establishment of Required Elements in Procedures	Y/N	Location	Execution of Procedures or Verification of Activity	Y/N	Objective Evidence or Comment
• Testing facility name, testing batch number, container numbers, and signature of the Site Project Officer (SPO) or designee(s) • Table of Contents • Background and performance check data or control charts for the relevant time period. • Data validation per the QAPD and site procedures • Separate testing report sheets for each container.			• Testing facility name, testing batch number, container numbers, and signature of the Site Project Officer (SPO) or designee(s) • Table of Contents • Background and performance check data or control charts for the relevant time period. • Data validation per the QAPD and site procedures • Separate testing report sheets for each container.		RLNDA0003, and RLNDA0016. Note that RLNDA0002 and RLNDA0016 through project level review.
Procedures require that testing report sheets include: • Title "Radioassay Data Sheet" • Method/procedure used • Date of radioassay • Activities and associated TMU for individual radionuclides • TRU alpha concentration and its associated TMU • Operator signature • Reviewer signature	Y	CCP-PO-002, Revision 6, Section A.4.5.2 (Page 99-100)	Testing report sheets include: • Title "Radioassay Data Sheet" • Method/procedure used • Date of radioassay • Activities and associated TMU for individual radionuclides • TRU alpha concentration and its associated TMU • Operator signature • Reviewer signature	Y	Reviewed radioassay data sheets in Batch Data Reports RLNDA0001, (Containers 0013528, 0013588, 0013720, 0013666, 0013477, 0013674), RLNDA0002 (0013678, 0013652, 0013668, 0013632, 0013676, 0013589), RLNDA0003 0013623, 0013592, 0013174, 0013713, 0013621, 0013591), and RLNDA0016 (0014074, 0013343).
Procedures require that the following nonpermanent records be maintained at the radioassay-testing facility or forwarded to the site project office: • Testing batch reports • All raw data, including instrument readouts, calculation records, and radioassay QC results • All applicable instrument calibration reports	Y	CCP-PO-002, Revision 6, Section A.4.5.3 (Page 100)	The following nonpermanent records be maintained at the radioassay-testing facility or forwarded to the site project office: • Testing batch reports • All raw data, including instrument readouts, calculation records, and radioassay QC results • All applicable instrument calibration reports	Y	Data, including raw data is backed up to ZIP disks and hard drives, and written to compact discs (CDs).

A.3 - Nondestructive Examination (NDE) Checklist for Inspection EPA- Hanford-CCP-09.03-8
September 8-12, 2003, at Hanford Site

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
Site procedures identify required training and qualifications for Radiography personnel. Radiography operators are instructed in the specific waste generating practices and typical packaging configurations expected to be found in each matrix parameter category at the site.	Y CCP-TP-028, Revision 1 CCP-TP-099, Revision 0	• Employee's explanation of job duties was consistent with applicable procedures. • Operator could name prohibited items. • Operator's explanation of required actions if prohibited items were encountered was consistent with procedure. • Operator could identify applicable policies and procedures governing the operation of radiography equipment. • Operator adequately explained the consequences of misidentifying prohibited items. • Operators passed a training drum test that includes items common to the waste streams generated/stored at the site. • Operators identify the limitations of their system and explain the process of identifying and managing drums with prohibited items. • Operator's training was consistent with applicable procedures. • Operator's certification is current.	Y Y Y Y Y Y Y	• Reviewed training records of test drum for E. Lee Smith, T. Hasselstrom, S. Galbraith, A. Chandler, K. Simpson, L. Lamb. • Interviewed K. Simpson, L. Lamb, A. Chandler. • Reviewed training records of test drum for E. Lee Smith, T. Hasselstrom, S. Galbraith, A. Chandler, K. Simpson, L. Lamb.
There is a procedure for determining if the resolution of the Radiography equipment is sufficient to image the types of waste and waste containers likely to be encountered at this site. The procedure allows the operator to adjust Radiography to accommodate the physical properties of the waste and waste containers likely to be encountered at this site.	Y CCP-TP-099, Revision 0	• Operator adequately explained how to adjust the system to image the range of wastes likely to be encountered at this specific site • The Radiography system could be adjusted • Operator adequately explained how the presence of free liquids is determined Operator adequately explained how the acceptability of an image is determined • Operator adequately explained what is done if an image is unacceptable (e.g., the waste is solidified or the container is lead-lined). • The X-ray producing device has controls that allow	Y Y Y Y Y	• Interviewed K. Simpson, L. Lamb, A. Chandler, T. Hasselstrom • Examined Batch Data Reports RLRTR0002, RLRTR0005, RLRTR0006, RLRTR0007, RLRTR0010, RLRTR0018, RLRTR0021, RLRTR0022, RLRTR0024

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
		the operator to vary voltage, thereby controlling image quality. • High-density material was examined with the X-ray device set on the maximum voltage. • Low density material was examined at lower voltage settings to improve contrast and image definition.	Y Y Y	
		Radiography tape is typically high quality, the sound track is audible, and the required information is contained on the audible portion of the tape. The Radiography tape is consistent with the data package for the same drum.	Y	• Reviewed videotapes for Batch Data Reports RLRTR0007 and RLRTR0024
Procedures require that Radiography operators receive the results of the VE/Radiography comparison.	ID	Radiography operators receive the results of the VE/Radiography comparison.	ID	Indeterminate.
There is a procedure for determining whether the waste stream assignment, hazardous waste codes, and weights were correctly assigned.	Y CCP-TP-099, Revision 0	• The procedure is adequately implemented. • Corrective actions are taken when necessary. • Does the radiography operator use a standard weight lookup table to provide an estimate of WMP weights? If so, has the table been updated to reflect additional information gained through previous RTR/VE exams or updated AK information?	Y	• Interviewed K. Simpson, L. Lamb, A. Chandler, T. Hasselstrom. Examined Batch Data Reports RLRTR0002, RLRTR0005, RLRTR0006, RLRTR0007, RLRTR0010, RLRTR0018, RLRTR0021, RLRTR0022, RLRTR0024
		The site evaluates the accuracy and reproducibility of data, for example: • Independent replicate scans are performed on one waste container per day per testing (whichever is less frequent) • Independent observations of one scan (not the replicate scan) are performed once per day per testing, whichever is less frequent, by a qualified Radiography operator (anyone but the initial Radiography operator) • Oversight functions, including periodic audio/videotape reviews of accepted waste containers are performed by qualified radiography personnel other than the operator		• Interviewed K. Simpson, L. Lamb, A. Chandler, T. Hasselstrom • Examined Batch Data Reports RLRTR0002, RLRTR0005, RLRTR0006, RLRTR0007, RLRTR0010, RLRTR0018, RLRTR0021, RLRTR0022, RLRTR0024
		Radiography operator has received “lessons learned” information based on the comparison of Radiography and VE data.	ID	Indeterminate.
		Radiography operator adequately explained the process followed for examining a drum and entering data into data forms (whether hard copy or electronic data entry is used).	Y	• Interviewed K. Simpson, L. Lamb, A. Chandler, T. Hasselstrom.

A.4 - WIPP Waste Inventory System (WWIS) Checklist for Inspection EPA- Hanford-CCP-09.03-8 September 8-12, 2003, at Hanford Site

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comments
Procedures require WWIS and Data Expert/Staff to be trained to assess data and properly enter transfer data in the WWIS11	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	Employee's explanation of job duties was consistent with applicable procedures.	Y	Leanne Hackney & JR Stroble demonstrated the entire waste cert and data entry process.
	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	WWIS and Data Expert/Staff are trained to assess data and properly enter and transfer all data in the WWIS. Data entry personnel and data reviewers/verifiers are trained on the WWIS system using the WIPP Waste Information System User's Manual and the appropriate site procedures?	Y Y	A demonstration of data assessment and entry was observed. A demonstration of observed and a copy of the system manual was presented.
	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	WWIS and Data Expert/Staff adequately explained how data are assessed, input, and transferred into the WWIS?	Y	L Hackney & J R Stroble adequately demonstrated and explained how data is assessed, input and transferred.
	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	For those sites entering data into WWIS using electronic methods, data entry personnel and data reviewers/verifiers are trained on the site's data system using appropriate site procedures.	Y	The demonstration included the Excel template Hanford_Template.xls which generates an electronic file for importation into the WWIS.
	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	Generation level data review checklists and reports are complete and have been verified by SPO and SQAO review for each waste container.	I	Process was adequately explained and demonstrated using surrogate data though at the time of the inspection, no actual data was available.
	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	Generation level data packages contain the following information: • Sampling, testing, and batch analytical data re • Data review checklists • Reviews and verification of generation level d packages are completed	Y	The demonstration included each of these elements.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comments
	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	Project level data packages contain the following information for each waste container: • Data validation summary • Analytical results Reviews of project level data packages are complete.	Y Y	Sample data was reviewed and verified to contain these elements. Observed.
There are adequate procedures for treatment of nonconforming data.	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	Procedures for nonconforming data are adequately implemented.	I	No nonconforming data has been encountered at the WWIS level as of the date of this inspection.
Security measures for ensuring data integrity and accessing WWIS are sufficient • System access • Access log review	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry			
There are adequate procedures for entering data into the WWIS.	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	Procedures for entering data into the WWIS are adequately implemented.	Y	The data entry simulation adequately demonstrated WWIS data entry procedure implementation.
		Data entered into the WWIS consistent with WIPP requirements, i.e., data fields are populated. [See Attachment A.4.1 for list of required data fields]	Y	The Excel template, Hanford_Template.xls was adequately demonstrated to include all of the necessary data fields.
The edit/limit checks contained in the WWIS system are appropriate for the site • Approved radioassay methods • Approved characterization methods • Approved analyte detection methods	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	The edit limit checks are appropriate.	Y	The demonstration included edit limit checks and were found to be adequate.
		The site adequately demonstrated its ability to transmit waste container characterization data to the WIPP using the WWIS.	Y	Simulated Data transmission was demonstrated.
		The site adequately demonstrated its ability to receive information from the WIPP via the WWIS, including E-mail notifications.	Y	An email response was returned from the WIPP site.

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/ Comments
		The site adequately demonstrated its ability to print the appropriate waste container characterization data reports for data submitted to WIPP using the WWIS.	Y	The demonstration included a printout of the simulated waste characterization data report.
The site has adequate procedures that require verification of the accuracy of waste container characterization data submitted to and received by WIPP using the WWIS. Waste container data reports are required to be reconciled with site data.	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	Waste container characterization data submitted to and received by WIPP are verified. Waste container data reports are reconciled with site data.	Y	The verification process was part of the demonstration. Data reconciliation was part of the data verification process.
Procedures for waste container characterization data submitted to WIPP using the WWIS require that the following records be kept: • WWIS access requests • WWIS access logs • Waste container data input reports • WWIS waste container data reports	Y CCP-TP-030 Rev 8, CCP TRU Waste Certification and WWIS Data Entry	The following records are kept: • WWIS access requests • WWIS access logs • Waste container data input reports • WWIS waste container data reports	Y	This data is available from the WWIS administrator at the WIPP site.

Attachment A.4.1
WWIS Data Requirements

Container number	Radionuclide name
Site ID	Radionuclide activity
Waste stream profile number	Radionuclide activity uncertainty
Matrix code	Radionuclide mass
Trucon Code	Radionuclide mass uncertainty
Decay heat	Waste material parameter weight
Decay heat uncertainty	Radioassay method
Shipment number	Assay date
Packaging number	Characterization method
Assembly ID	Characterization method date
TRU alpha activity	Packaging layers
TRU alpha activity uncertainty	Alpha surface concentration
TRU alpha activity concentration	Dose rate
TRU alpha activity concentration uncertainty	Sample ID
^{239}Pu equivalent activity	Sample type
^{239}Pu fissile gram equivalent	Sample date
^{239}Pu fissile gram equivalent uncertainty	Analyte
Handling code	Analyte concentration
Waste type code	Analyte detection method

Attachment B.1 - Replicate Test Data for Container 0013652 Assayed on the SGS

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{233}U Activity (Ci)			N/A			N/A			N/A
^{234}U Activity (Ci)			N/A			N/A			N/A
^{235}U Activity (Ci)			N/A			N/A			N/A
^{238}U Activity (Ci)			N/A			N/A			N/A
^{237}Np Activity (Ci)	1.31E-06	3.16E-07	24.1%	2.12E-06	4.24E-07	20.0%	1.69E-06	3.47E-07	20.5%
^{238}Pu Activity (Ci)	9.03E-02	2.47E-02	27.4%	8.70E-02	2.40E-02	27.6%	8.35E-02	2.30E-02	27.5%
^{239}Pu Activity (Ci)	1.27E+00	3.46E-01	27.2%	1.33E+00	3.64E-01	27.4%	1.27E+00	3.48E-01	27.4%
^{240}Pu Activity (Ci)	2.84E-01	7.74E-02	27.3%	3.19E-01	8.76E-02	27.5%	3.02E-01	8.26E-02	27.4%
^{241}Pu Activity (Ci)	5.12E+00	1.40E+00	27.3%	5.61E+00	1.54E+00	27.5%	5.35E+00	1.47E+00	27.5%
^{242}Pu Activity (Ci)	2.46E-05	7.15E-06	29.1%	2.80E-05	8.19E-06	29.3%	2.66E-05	7.74E-06	29.1%
^{241}Am Activity (Ci)	2.74E-01	4.93E-02	18.0%	2.40E-01	4.34E-02	18.1%	2.56E-01	4.61E-02	18.0%
^{90}Sr Activity (Ci)			N/A			N/A			N/A
^{137}Cs Activity (Ci)	1.17E-06	2.11E-07	18.0%	1.03E-06	1.85E-07	18.0%	1.10E-06	1.97E-07	17.9%
TRU Alpha (nCi/g)	64,500	12,100	18.8%	66,400	12,700	19.1%	64,300	12,200	19.0%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{233}U Activity (Ci)			N/A			N/A			N/A
^{234}U Activity (Ci)			N/A			N/A			N/A
^{235}U Activity (Ci)			N/A			N/A			N/A
^{238}U Activity (Ci)			N/A			N/A			N/A
^{237}Np Activity (Ci)	7.81E-07	2.49E-07	31.9%	1.51E-06	3.20E-07	21.2%	1.75E-06	3.69E-07	21.1%
^{238}Pu Activity (Ci)	8.53E-02	2.35E-02	27.5%	9.94E-02	2.73E-02	27.5%	9.79E-02	2.70E-02	27.6%
^{239}Pu Activity (Ci)	1.31E+00	3.60E-01	27.5%	1.30E+00	3.56E-01	27.4%	1.31E+00	3.61E-01	27.6%
^{240}Pu Activity (Ci)	3.10E-01	8.50E-02	27.4%	3.20E-01	8.76E-02	27.4%	3.11E-01	8.55E-02	27.5%
^{241}Pu Activity (Ci)	5.30E+00	1.46E+00	27.5%	5.81E+00	1.59E+00	27.4%	6.12E+00	1.68E+00	27.5%
^{242}Pu Activity (Ci)	2.71E-05	7.90E-06	29.2%	2.85E-05	8.30E-06	29.1%	2.79E-05	8.15E-06	29.2%
^{241}Am Activity (Ci)	2.62E-01	4.73E-02	18.1%	2.71E-01	4.90E-02	18.1%	2.88E-01	5.17E-02	18.0%
^{90}Sr Activity (Ci)			N/A			N/A			N/A
^{137}Cs Activity (Ci)	1.12E-06	2.02E-07	18.0%	1.16E-06	2.09E-07	18.0%	1.23E-06	2.20E-07	17.9%
TRU Alpha nCi/g	66,200	12,600	19.0%	66,900	12,500	18.7%	67,700	12,600	18.6%

Attachment B.2 - Replicate Test Results for Container 0013652 Assayed on the SGS

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \lvert\chi^2\rvert$)	t	Pr($x < \lvert t \rvert$)
	Reported Value	Absolute Uncertainty							
^{233}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{235}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{238}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{237}Np Activity (Ci)	1.31E-06	3.16E-07	1.57E-06	4.94E-07	31.4%	9.768	0.045	-0.481	0.656
^{238}Pu Activity (Ci)	9.03E-02	2.47E-02	9.06E-02	7.45E-03	8.2%	0.364	0.985	-0.039	0.971
^{239}Pu Activity (Ci)	1.27E+00	3.46E-01	1.30E+00	2.19E-02	1.7%	0.016	1.000	-1.417	0.230
^{240}Pu Activity (Ci)	2.84E-01	7.74E-02	3.12E-01	7.37E-03	2.4%	0.036	1.000	-3.518	0.024
^{241}Pu Activity (Ci)	5.12E+00	1.40E+00	5.64E+00	3.39E-01	6.0%	0.235	0.994	-1.395	0.236
^{242}Pu Activity (Ci)	2.46E-05	7.15E-06	2.76E-05	7.60E-07	2.8%	0.045	1.000	-3.629	0.022
^{241}Am Activity (Ci)	2.74E-01	4.93E-02	2.63E-01	1.78E-02	6.8%	0.521	0.971	0.544	0.616
^{90}Sr Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{137}Cs Activity (Ci)	1.17E-06	2.11E-07	1.13E-06	7.40E-08	6.6%	0.491	0.974	0.518	0.632
TRU Alpha Conc. (nCi/g)	64,500	12,100	66,300	1,259	1.9%	0.043	1.000	-1.305	0.262

Quantity of Interest	χ^2 Test	t Test
^{233}U Activity (Ci)	Not Applicable	Not Applicable
^{234}U Activity (Ci)	Not Applicable	Not Applicable
^{235}U Activity (Ci)	Not Applicable	Not Applicable
^{238}U Activity (Ci)	Not Applicable	Not Applicable
^{237}Np Activity (Ci)	Significant	Not Significant
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{239}Pu Activity (Ci)	Not Significant	Not Significant
^{240}Pu Activity (Ci)	Not Significant	Significant
^{241}Pu Activity (Ci)	Not Significant	Not Significant
^{242}Pu Activity (Ci)	Not Significant	Significant
^{241}Am Activity (Ci)	Not Significant	Not Significant
^{90}Sr Activity (Ci)	Not Applicable	Not Applicable
^{137}Cs Activity (Ci)	Not Significant	Not Significant
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

Attachment B.3 - Replicate Test Data for Container 0013665 Assayed on the SGS

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{233}U Activity (Ci)			N/A			N/A			N/A
^{234}U Activity (Ci)			N/A			N/A			N/A
^{235}U Activity (Ci)			N/A			N/A			N/A
^{238}U Activity (Ci)			N/A			N/A			N/A
^{237}Np Activity (Ci)			N/A			N/A			N/A
^{238}Pu Activity (Ci)	9.59E-04	5.48E-04	57.1%	7.41E-04	4.43E-04	59.8%	2.65E-04	4.47E-04	168.7%
^{239}Pu Activity (Ci)	5.73E-02	1.98E-02	34.6%	5.79E-02	2.01E-02	34.7%	5.86E-02	2.02E-02	34.5%
^{240}Pu Activity (Ci)	8.53E-03	2.99E-03	35.1%	8.12E-03	2.85E-03	35.1%	8.25E-03	2.89E-03	35.0%
^{241}Pu Activity (Ci)	4.19E-02	1.51E-02	36.0%	5.76E-02	2.03E-02	35.2%	4.62E-02	1.65E-02	35.7%
^{242}Pu Activity (Ci)	4.06E-07	1.53E-07	37.7%	4.03E-07	1.51E-07	37.5%	3.92E-07	1.49E-07	38.0%
^{241}Am Activity (Ci)	5.35E-02	1.12E-02	20.9%	5.97E-02	1.23E-02	20.6%	3.56E-02	8.27E-03	23.2%
^{90}Sr Activity (Ci)			N/A			N/A			N/A
^{137}Cs Activity (Ci)			N/A			N/A			N/A
TRU Alpha Conc. (nCi/g)	4,150	793	19.1%	4,340	815	18.8%	3,530	757	21.4%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{233}U Activity (Ci)			N/A			N/A			N/A
^{234}U Activity (Ci)			N/A			N/A			N/A
^{235}U Activity (Ci)			N/A			N/A			N/A
^{238}U Activity (Ci)			N/A			N/A			N/A
^{237}Np Activity (Ci)			N/A			N/A			N/A
^{238}Pu Activity (Ci)	1.43E-03	6.29E-04	44.0%	1.42E-03	6.55E-04	46.1%	8.45E-04	5.20E-04	61.5%
^{239}Pu Activity (Ci)	5.04E-02	1.78E-02	35.3%	5.86E-02	2.00E-02	34.1%	6.01E-02	2.06E-02	34.3%
^{240}Pu Activity (Ci)	7.25E-03	2.58E-03	35.6%	8.29E-03	2.86E-03	34.5%	8.07E-03	2.81E-03	34.8%
^{241}Pu Activity (Ci)	5.14E-02	1.85E-02	36.0%	5.54E-02	1.93E-02	34.8%	5.15E-02	1.82E-02	35.3%
^{242}Pu Activity (Ci)	3.64E-07	1.39E-07	38.2%	4.09E-07	1.52E-07	37.2%	3.71E-07	1.40E-07	37.7%
^{241}Am Activity (Ci)	5.95E-02	1.23E-02	20.7%	5.33E-02	1.12E-02	21.0%	4.89E-02	1.01E-02	20.7%
^{90}Sr Activity (Ci)			N/A			N/A			N/A
^{137}Cs Activity (Ci)			N/A			N/A			N/A
TRU Alpha Conc. (nCi/g)	4,070	747	18.4%	4,170	792	19.0%	4,058	793	19.5%

Attachment B.4 - Replicate Test Results for Container 0013665 Assayed on the SGS

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \|\chi^2\|$)	t	Pr($x < \|t\|$)
	Reported Value	Absolute Uncertainty							
^{233}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{235}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{238}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{237}Np Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{238}Pu Activity (Ci)	9.59E-04	5.48E-04	9.40E-04	4.94E-04	52.5%	3.246	0.518	0.035	0.974
^{239}Pu Activity (Ci)	5.73E-02	1.98E-02	5.71E-02	3.84E-03	6.7%	0.151	0.997	0.043	0.968
^{240}Pu Activity (Ci)	8.53E-03	2.99E-03	8.00E-03	4.27E-04	5.3%	0.081	0.999	1.142	0.317
^{241}Pu Activity (Ci)	4.19E-02	1.51E-02	5.24E-02	4.37E-03	8.3%	0.335	0.987	-2.199	0.093
^{242}Pu Activity (Ci)	4.06E-07	1.53E-07	3.88E-07	1.97E-08	5.1%	0.066	0.999	0.845	0.446
^{241}Am Activity (Ci)	5.35E-02	1.12E-02	5.14E-02	9.92E-03	19.3%	3.141	0.535	0.193	0.856
^{90}Sr Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{137}Cs Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRU Alpha Conc. (nCi/g)	4,150	793	4,034	303	7.5%	0.585	0.965	0.350	0.744

Quantity of Interest	χ^2 Test	t Test
^{233}U Activity (Ci)	Not Applicable	Not Applicable
^{234}U Activity (Ci)	Not Applicable	Not Applicable
^{235}U Activity (Ci)	Not Applicable	Not Applicable
^{238}U Activity (Ci)	Not Applicable	Not Applicable
^{237}Np Activity (Ci)	Not Applicable	Not Applicable
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{239}Pu Activity (Ci)	Not Significant	Not Significant
^{240}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Pu Activity (Ci)	Not Significant	Not Significant
^{242}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Am Activity (Ci)	Not Significant	Not Significant
^{90}Sr Activity (Ci)	Not Applicable	Not Applicable
^{137}Cs Activity (Ci)	Not Applicable	Not Applicable
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant

Attachment B.5 - Replicate Test Data for Container 6000-5-15 Assayed on the SGS

Quantity of Interest	Original Measurement			Replicate #1			Replicate #2		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{233}U Activity (Ci)			N/A			N/A			N/A
^{234}U Activity (Ci)	5.10E-05	1.54E-05	30.2%	6.79E-05	1.91E-05	28.1%	4.57E-05	1.34E-05	29.3%
^{235}U Activity (Ci)	8.49E-07	3.21E-07	37.8%	1.25E-06	4.24E-07	33.9%			N/A
^{238}U Activity (Ci)	2.55E-05	7.70E-06	30.2%	3.39E-05	9.53E-06	28.1%	2.28E-05	6.72E-06	29.5%
^{237}Np Activity (Ci)	3.20E-06	8.82E-07	27.6%	3.14E-06	8.63E-07	27.5%	3.09E-06	8.29E-07	26.8%
^{238}Pu Activity (Ci)	5.90E-02	1.63E-02	27.6%	4.26E-02	1.57E-02	36.9%	5.31E-02	1.96E-02	36.9%
^{239}Pu Activity (Ci)	4.02E-01	1.06E-01	26.4%	3.45E-01	1.23E-01	35.7%	3.65E-01	1.31E-01	35.9%
^{240}Pu Activity (Ci)	1.97E-01	5.22E-02	26.5%	1.49E-01	5.35E-02	35.9%	1.75E-01	6.32E-02	36.1%
^{241}Pu Activity (Ci)	2.93E+00	7.77E-01	26.5%	2.32E+00	8.30E-01	35.8%	2.69E+00	9.70E-01	36.1%
^{242}Pu Activity (Ci)	2.55E-05	7.27E-06	28.5%	1.79E-05	6.67E-06	37.3%	2.34E-05	8.78E-06	37.5%
^{241}Am Activity (Ci)	1.05E-01	2.90E-02	27.6%	3.09E-01	8.16E-02	26.4%	2.96E-01	7.85E-02	26.5%
^{90}Sr Activity (Ci)			N/A			N/A			N/A
^{137}Cs Activity (Ci)			N/A			N/A			N/A
TRU Alpha Conc. (nCi/g)	8,450	1,360	16.1%	9,380	1,750	18.7%	9,860	1,850	18.8%

Quantity of Interest	Replicate #3			Replicate #4			Replicate #5		
	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty	Reported Value	Absolute Uncertainty	Relative Uncertainty
^{233}U Activity (Ci)			N/A			N/A			N/A
^{234}U Activity (Ci)	6.77E-05	1.92E-05	28.4%	6.66E-05	1.87E-05	28.1%	6.50E-05	1.82E-05	28.0%
^{235}U Activity (Ci)	9.34E-07	3.43E-07	36.7%	7.63E-07	2.74E-07	35.9%	8.69E-07	3.87E-07	44.5%
^{238}U Activity (Ci)	3.39E-05	9.61E-06	28.3%	3.33E-05	9.35E-06	28.1%	3.25E-05	9.11E-06	28.0%
^{237}Np Activity (Ci)	2.96E-06	8.06E-07	27.2%	2.78E-06	7.52E-07	27.1%	3.12E-06	8.57E-07	27.5%
^{238}Pu Activity (Ci)	5.19E-02	1.91E-02	36.8%	5.12E-02	1.88E-02	36.7%	6.30E-02	2.30E-02	36.5%
^{239}Pu Activity (Ci)	3.58E-01	1.28E-01	35.8%	3.27E-01	1.18E-01	36.1%	3.90E-01	1.39E-01	35.6%
^{240}Pu Activity (Ci)	1.68E-01	6.02E-02	35.8%	1.52E-01	5.47E-02	36.0%	1.89E-01	6.79E-02	35.9%
^{241}Pu Activity (Ci)	2.57E+00	9.21E-01	35.8%	2.39E+00	8.61E-01	36.0%	2.90E+00	1.04E+00	35.9%
^{242}Pu Activity (Ci)	2.21E-05	8.30E-06	37.6%	2.09E-05	7.87E-06	37.7%	2.70E-05	1.01E-05	37.4%
^{241}Am Activity (Ci)	2.27E-01	6.05E-02	26.7%	2.54E-01	6.76E-02	26.6%	8.90E-02	2.48E-02	27.9%
^{90}Sr Activity (Ci)			N/A			N/A			N/A
^{137}Cs Activity (Ci)			N/A			N/A			N/A
TRU Alpha Conc. (nCi/g)	8,920	1,720	19.3%	8,690	1,640	18.9%	8,100	1,760	21.7%

Attachment B.6 - Replicate Test Results for Container 6000-5-15 Assayed on the SGS

Quantity of Interest	Original Measurement		Sample Mean	Sample Standard Deviation	Relative Standard Deviation	χ^2	Pr($x < \|\chi^2\|$)	t	Pr($x < \|t\|$)
	Reported Value	Absolute Uncertainty							
^{233}U Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{234}U Activity (Ci)	5.10E-05	1.54E-05	6.26E-05	9.51E-06	15.2%	1.524	0.822	-1.112	0.328
^{235}U Activity (Ci)	8.49E-07	3.21E-07	9.54E-07	2.10E-07	22.0%	1.278	0.734	-0.448	0.684
^{238}U Activity (Ci)	2.55E-05	7.70E-06	3.13E-05	4.78E-06	15.3%	1.538	0.820	-1.105	0.331
^{237}Np Activity (Ci)	3.20E-06	8.82E-07	3.02E-06	1.50E-07	5.0%	0.116	0.998	1.105	0.331
^{238}Pu Activity (Ci)	5.90E-02	1.63E-02	5.24E-02	7.26E-03	13.9%	0.793	0.939	0.835	0.450
^{239}Pu Activity (Ci)	4.02E-01	1.06E-01	3.57E-01	2.34E-02	6.6%	0.196	0.996	1.752	0.155
^{240}Pu Activity (Ci)	1.97E-01	5.22E-02	1.67E-01	1.66E-02	9.9%	0.403	0.982	1.676	0.169
^{241}Pu Activity (Ci)	2.93E+00	7.77E-01	2.57E+00	2.34E-01	9.1%	0.361	0.986	1.392	0.236
^{242}Pu Activity (Ci)	2.55E-05	7.27E-06	2.23E-05	3.34E-06	15.0%	0.845	0.932	0.885	0.426
^{241}Am Activity (Ci)	1.05E-01	2.90E-02	2.35E-01	8.79E-02	37.4%	36.787	0.000	-1.349	0.249
^{90}Sr Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
^{137}Cs Activity (Ci)	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRU Alpha Conc. (nCi/g)	8,450	1,360	8,990	670	7.5%	0.971	0.914	-0.736	0.503

Quantity of Interest	χ^2 Test	t Test
^{233}U Activity (Ci)	Not Applicable	Not Applicable
^{234}U Activity (Ci)	Not Significant	Not Significant
^{235}U Activity (Ci)	Not Significant	Not Significant
^{238}U Activity (Ci)	Not Significant	Not Significant
^{237}Np Activity (Ci)	Not Significant	Not Significant
^{238}Pu Activity (Ci)	Not Significant	Not Significant
^{239}Pu Activity (Ci)	Not Significant	Not Significant
^{240}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Pu Activity (Ci)	Not Significant	Not Significant
^{242}Pu Activity (Ci)	Not Significant	Not Significant
^{241}Am Activity (Ci)	Highly Significant	Not Significant
^{90}Sr Activity (Ci)	Not Applicable	Not Applicable
^{137}Cs Activity (Ci)	Not Applicable	Not Applicable
TRU Alpha Conc. (nCi/g)	Not Significant	Not Significant